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Analyzing the Production Operation

By E. F. Brown
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The time-study man must be an analyst—Winning the confidence of the workman—Dissecting the job and suggesting improvements in the operation

THERE are two distinct elements in time study, the human and the technical. The success of the technical element depends greatly on the manner in which the human element is handled. The first thing a time-study observer has to do is to collect all of the information available pertaining to the job. This is often difficult, as the man who has been working on the job for some time has learned "trade secrets," and he will not part with them unless he is shown how he can be benefited by doing so. Unless the time-study man is able to do this, he has to start under a handicap. He must first win the confidence of the workman. He should explain the method to be applied, and keep him in touch with the progress that is being made. The time-study man should also consider seriously any suggestion made by the workman, and if the suggestion cannot be applied, he should give a good reason why, and not try to impress the workman with superior knowledge. We are all anxious to show how much we know. Therefore, the time-study man should utilize this factor to assist him in obtaining the information he is seeking by giving the workman a chance at it. The time-study man's tact consists mainly in recognizing that the people with whom he is associating in the shop are human, and as subject to human reaction as he is. The order of work of the time-study man is as follows: 1. Determine if the operation to be studied is necessary. 2. Get data on the life of the tools and miscellaneous stoppages. 3. Make a detailed investigation. 4. Make the time study. 5. Write up the analysis and instructions. 6. Instruct the workman.

Time study is by no means a simple operation of taking a worker's time. The author of this article attempts to show how an efficient time-study man analyzes all phases of an operation, as well as studies the worker

It is frequently discovered, on detailed investigation, that an unnecessary operation is being done on a part. An operation is sometimes started because of certain existing conditions, and when the cause for the operation is removed at some future date, the operation is still continued, due to someone's negligence. Then again, it is sometimes possible to change slightly the design of a machine part, which will make certain operations unnecessary, or an operation can be combined with another by a change in the fixture or in the tool, thus eliminating one of the individual operations.

The investigation should start with a knowledge of existing conditions. This cannot be learned by casual observation. The observer should record everything that interferes with the operation for a period of time. The length of time that it is necessary to take the data depends on how complicated the operation may be, and also on how thorough the investigation is to be. If the number of parts made per year is few it will not pay to make as complete an investigation as if many of the parts were used per year.

While the observer is checking up on stoppages and also the life of the tools, he should note other details that will need attention. During this time he should observe and analyze the general conditions governing the operation. To assist him in these observations the following list of suggestions has been compiled:

1. Is this the best machine for the job?
2. Is the machine properly located?
3. Can the machine, jig, or fixture be improved?
4. Can any of the details be eliminated?
5. Is the operation safe for the workman?

6. Are the limits of the work closer than necessary?
7. Is the work of the required quality?
8. Is the feed and speed of the machine right?
9. Is the operator supplied with material continually, and in the proper manner?
10. Are the personal, mental, and physical characteristics of the operator such as make him best fitted for this particular job?

The location of the machine is important. There should be sufficient light for the workman to enable him to set tools properly, or place parts in the die or fixture without fumbling. The relative position of the operation with regard to preceding and succeeding operations should also be considered for the purpose of reducing the amount of trucking.

Not Necessary to Re-equip

Placing the parts and removing them from the jigs or fixtures, and clamping the work in the fixtures, are details that can often be improved. Sometimes a new set of tools may be necessary, but it is most important to use the existing equipment to the best advantage. It is not the duty of the investigator to invent new tools.

Poor quality of work and low production are sometimes due to a faulty condition of the machine. The following is a list of conditions frequently found:

1. End play, or up and down thrust in the spindle.
2. Play in cross-slide.
3. Play in carriage due to worn ways.
4. Chuck running out of true.
5. Belts loose, too narrow, or not heavy enough.
6. Loose countershaft frictions.
7. Pump not supplying enough oil.

The investigator should see that these conditions are corrected before attempting to speed up the machine.

The cutting tools also constitute a factor in the quality and quantity of production. The investigator must know of what steel the tool is made. Then, for a more thorough study he may make a sketch of the tool as used in operation to show the rake and clearance.

The next points to be considered are the feed per revolution of the tool, and the surface speed. To determine the proper feed per revolution and the surface speed, the proper life of the tool and the time required to grind and set the tool should be taken into consideration. It may be more economical to run the job at a lower feed and speed when the cost of the tool is considered. If the cost per piece is increased by high speed there is no advantage in speeding up the machine.

A factor more important than the cost of the product is the quality of the work. It is of little value to find that a tool can stand a high feed and speed if the required quality cannot be maintained. Production is useless if it is not of the required quality. The time-study observer must therefore investigate this factor, and find just what quality is required. The product may be as good at the high speed as it was when the investigation was started, but this does not always mean that it is good enough.

The time-stody observer should also look into conditions governing the comfort and safety of the operator. The work should be piled at a convenient distance to allow for safety in operating the machine. The investigator should see that all safety devices are in use, that gear guards and belt guards are in place, and that there are no projecting setscrews on rapidly rotating parts of the machine.

When the detailed investigation has been completed and the necessary changes made, the time-study observer will again get data on the life of the tools, and on miscellaneous stoppages. This information will be of use in setting the task, and also for checking up the results of the changes that have been made.

By breaking up the operation into separate elements in making the time study, the detailed operations that remain the same can be separated from those that do not. The machine and hand operations should be kept separate. This enables the time-study man to get accurate time on each of the machining operations. If it is ever found necessary to add to the machine operation for any reason, this can be done without restudying the whole operation. The hand operations are broken up according to convenient points of operation. This is worked out by the time-study man to facilitate the work necessary for making the time study. The time-study man must read the stop watch, write the readings on the time-study sheet, and observe the operation all at the same time. It is therefore necessary to have the point of observation so that it can be watched without looking up from the stop watch. The time-study man should place himself as near the job and the operator as possible without interfering with him. He should always stand up, rather than lounge on a stool some distance away. The effect that this point has on the workman is evident.

Variation in Details

Readings on at least twenty pieces should be taken, and where the operation is of very short duration it may be necessary to take more readings. This is especially so when there is a variation in the time of the various detailed operations. The following is a list of causes of variations in time on some of the sub-operations:

1. The jig, fixture, or tool may not be working properly.
2. All commercial materials such as forgings and castings have variations.
3. Lack of experience on the operator's part.
4. The time-study man's readings.

An istruction card is made out, giving all necessary information to the operator for setting up and running the operation. A rate card is made out for the shop clerk, giving the time allowance, number of pieces per hour, and kind or class of workman needed to run the operation. A card giving the list of tools is made out to be used in the tool crib, a copy of which should be kept in the shop office.

After determining the best method of doing the job, the time-study man should train the workman to do the operation that way. The time-study man now becomes an instructor. He has to break the workman of old habits and teach him new ones. This has to be done by using tact so as to not cause any friction.

The workman must have a clear idea of the new method. He must also realize that the new way is easier and quicker and more profitable to him. The instructor should not get discouraged because the workman does not seem to accomplish at first what he has set out to do, but must see that the man is thoroughly familiar with the new method. It would be unwise to expect the workman to learn to do the job by just watching someone else do it. Only when the workman has become familiar with the new method, is he ready to go on bonus or piece-work.

Remodeled Railroad Shop Meets Present Need

By FRANK W. CURTIS
Western Editor, American Machinist

By removal of belting and shafts, and equipping all machines with individual motor drives, an old western railroad shop has been given the appearance of an up-to-date plant

DURING the past year and a half, the Union Pacific Railroad Co. has revamped its 40-yr. old shop at Denver, Colo., making changes that have modernized the equipment and given the shop the appearance of an up-to-date plant. The outstanding improvement was the installation of individual motor drives to all machines. Before this change was made, the shop contained a network of belts, shafts and overhead timbers as well as the posts required to support this equipment. Six carloads of shafting and timber were removed to complete the undertaking. Formerly, there were work benches around the walls of the shop, which were collectors of miscellaneous scrap that was piled about in such a way as to make a disorderly appearance. The benches have been replaced by modern metal-stands at necessary locations, offering ample passageway about the machines which, heretofore was limited. In addition to these improvements, new machinery has been installed to meet the increased requirements of locomotive maintenance. The shop has ten pits, one of which is equipped with a 200-ton Whiting lift for stripping and wheeling purposes. In Fig. 1 is shown an engine raised by the lift to be wheeled. Locomotives to be reconditioned are first taken to this pit and unwheeled, after which they are lowered on dollies and transferred to one of the other pits. Upon completion of the necessary repairs, they are brought back to this pit to be wheeled, as shown in the illustration.

Fig. 1—Lift used for stripping and wheeling locomotives

Pistons are rebuilt by casting phosphor-bronze around the outside and re-machining the grooves and the periphery as illustrated in Fig. 2. First, the worn piston is turned true, then machined with four dovetailed slots located between the ring grooves and the outer edges to anchor the bronze. In casting the bronze on the piston, it is necessary to heat the piston before placing it in the mold so that the shrinkage will be uniform.

Among the newer machines is the driving-box mill shown in Fig. 3. The work is held by a universal two-jaw chuck having setscrews in the jaws to hold the work down on parallels. One cut only is taken on the face of the crown brass, while the bore requires a roughing and a finishing cut. A box is completed in 15 min., floor to floor time, including the time required to check the size of the bore. Several grinding machines have been installed to handle miscellaneous work such as that requiring cylindrical-surface and form grinding. The link grinder illustrated in Fig. 4 is shown with a new link held in the fixture. Two U-shaped brackets locate the link while the setscrews in the projecting arm clamp it securely. The machine is used also to grind link blocks. The blocks are ground first, then the link is ground to suit the block, allowing a running clearance of 0.006 in. Between $\frac{1}{32}$ and $\frac{1}{16}$ in. of metal is removed from links.

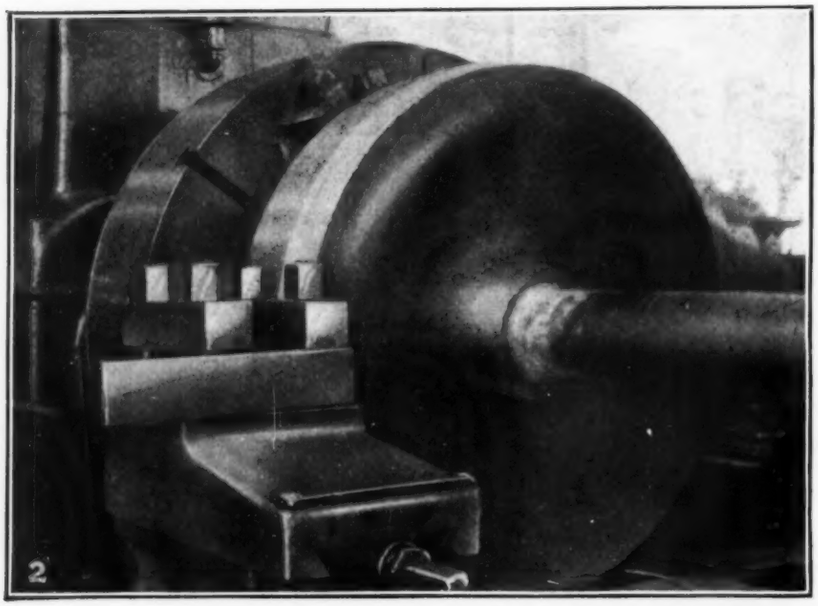
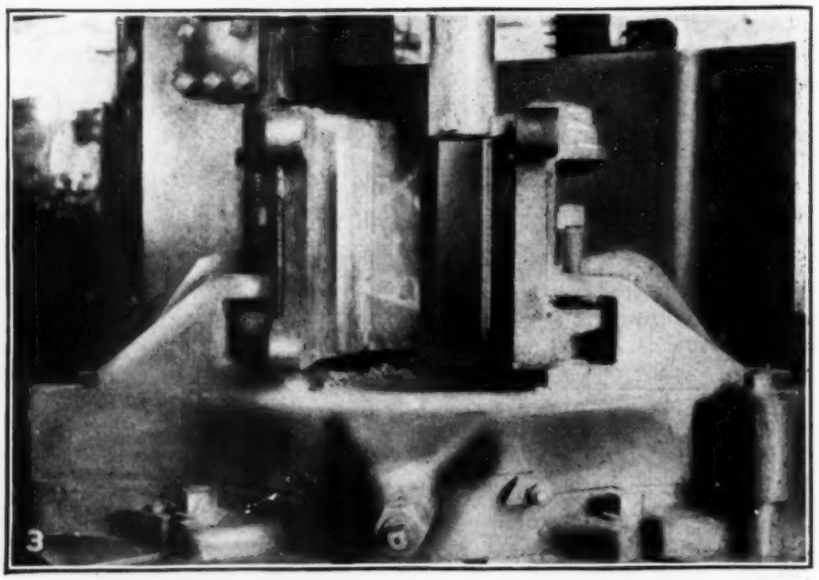


Fig. 2—Turning bronze that has been cast on a worn piston. When a piston is badly worn, it is first turned true, and then four dovetailed slots are cut around the outer diameter, to act as anchors in holding the metal in place. The piston is then heated, placed in a sand mold and a ring of phosphor bronze is cast around the outside of the head

Fig. 3—Driving-box crown brasses are faced and bored at a rapid rate in the machine shown. The box is held by screws on each flange, in order to avoid springing the sides. A single cut finishes the face of the crown brass, while two cuts are taken in the bore. Four boxes an hour can be handled without difficulty



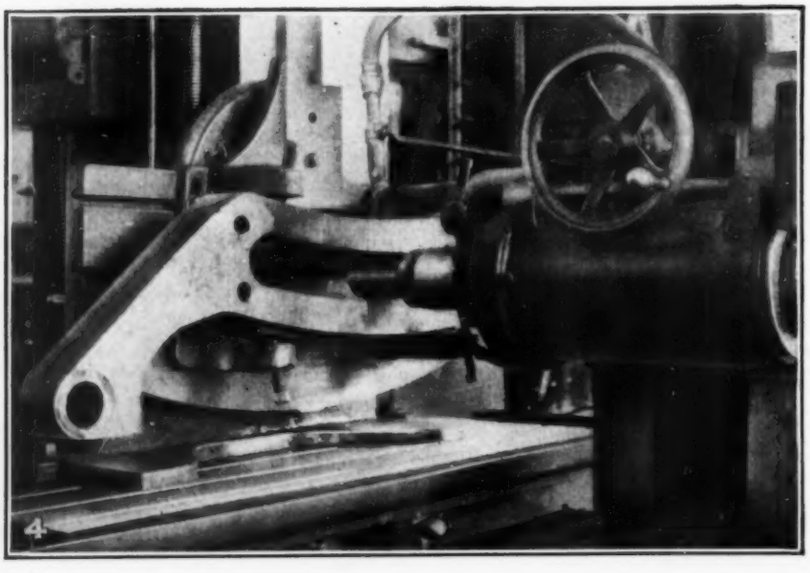


Fig. 4 — Grinding a Walschaert link on a pendulum-type grinding machine. The link is held in a fixture that will handle a variety of shapes and sizes with slight adjustment of the clamping blocks and screws. Link blocks can be ground to the same radius by locating them against the angle plate in the proper position. A clearance of 0.006 in. is allowed

New links are ground in 2 hr., while reconditioned links require but 1½ hr. to complete. A wheel, 2½ in. in diameter and 6 in. in width, is used.

Flat parts, such as crosshead guides, slide valves and the sides of links, are ground in the machine illustrated in Fig. 5. A guide is shown set up in a fixture made in three sections. Each section has a locating surface

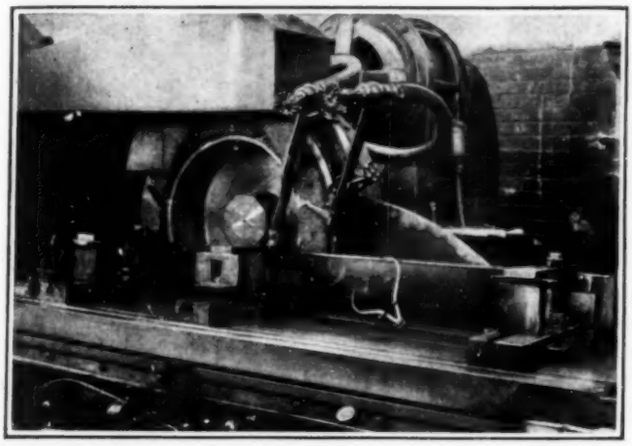


Fig. 5—Surface grinding a cross-head guide

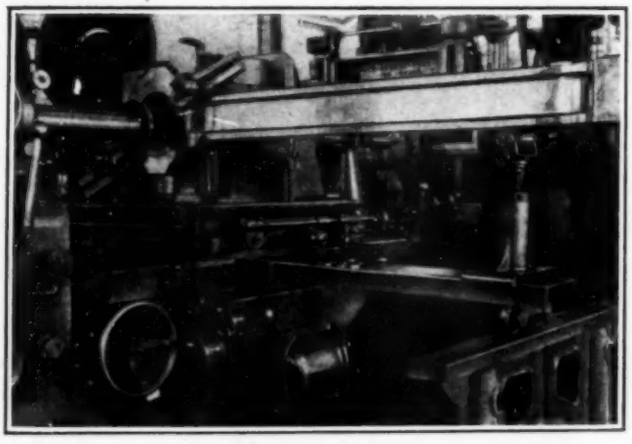


Fig. 6—Grinding a front-section connection rod

and a clamp for holding the guide. Guides are ground in sets of four, so that they will be uniform in size. A sufficient amount of material is removed to render a smooth surface. The feed 0.002 in. per stroke. The machine carries a 32-in. segmental wheel, flooded with coolant.

The holes in connecting rods are ground in the machine illustrated in Fig. 6. The rod shown is clamped against two parallels by two U-clamps to an angle plate. The projecting end of the rod rests on an adjustable support attached to an arm that travels with the machine table. The outboard end of the arm is equipped with two ball-bearing rollers and it travels on a stand. The bore of the rod being ground is 8 in. in diameter, and a 7-in. abrasive wheel having a ¾-in. face is used. Approximately 0.015 of metal is removed from a side. Both ends of the rod are completed in 1 hr., whereas old rods requiring reconditioning are completed in 35 min. The machine is used also for grinding air-pump cylinders.

Air mail receipts increased from $73,137.45 to $121,727.10 per month during the last six months of 1926.

Are We Too Academic?

By C. B. Gordon-Sale
England

"NO!" SAYS the practical engineer very emphatically in answer to the above question. At first thought this seems quite radical since we have to deal with things in hard metal which just have to work. But let us go a little further into the matter.

Engineering attracts many young lads, as all of us were in our time, and those of our parents who were in a position to do so set us on the path of technical training. For years we studied mathematics in its various forms pertaining to some branch of engineering, at that time quite out of our ken. Now we are far from those days and we may speak quite casually of technical training, but most of us know full well that it was about the hardest job we ever tackled. The only kind of encouragement which came our way was the thought that in the future we should astonish the mechanical world by the brilliance of our conceptions of engineering requirements. And so we plodded painfully through reams of highly ingenious though uninteresting matter related to acceleration diagrams, stresses, bolt sizes, and what not.

Then we went to the shops and disillusionment began to come our way. There did not seem to be so very much theory required for pushing a rough-cut file on a hot day. Comfortingly we though of the time when we should be engaged in design or planning or another of those departments slangily talked of in the shops.

When we reached the office all our training went smash, never to return. Where does theory come in with the average engineer? Very seldom, so seldom as to constitute a rarity when it has application.

I have thought much on the subject. Mark you, I do not agree that engineering is merely a matter of rule of thumb. On the contrary I hold that a thorough knowledge of the basic principles of mechanics is of the very greatest importance and should be gained by numerous experiments backed up by simple calculations. What I do think is that many of the involved theories, embodying yards of calculations, are out of place and liable to warp the mental outlook to such an extent that it takes years of practical experience in an administrative or advisory capacity for one to again attain a reasonable aspect of engineering problems.

Never have I had need to use much of my technical training, though doubtless it has influenced my mode of action. But I have often wanted some sort of knowledge of cost estimating and such things connected with the business side of work. My schooling taught me nothing of this important branch: it had to be picked up by corrected mistakes.

It has been stated that the various theories with their accompanying host of figures and algebraical symbols are necessary for the formation of a definite and logical mode of thought. The idea is all right, but I fancy it does not work out. "Cramming" is bad for anyone. The amount of matter that one has to get through is so much that there is no time for basic principles; the sole aim of college days it to get the numerical problems right.

Concluding I should like to say definitely that my opinion is that our training of engineers is far too academic and presses a brake on the wheel of engineering progress.

Electric Motor Standardization

By Robert Corey Deale

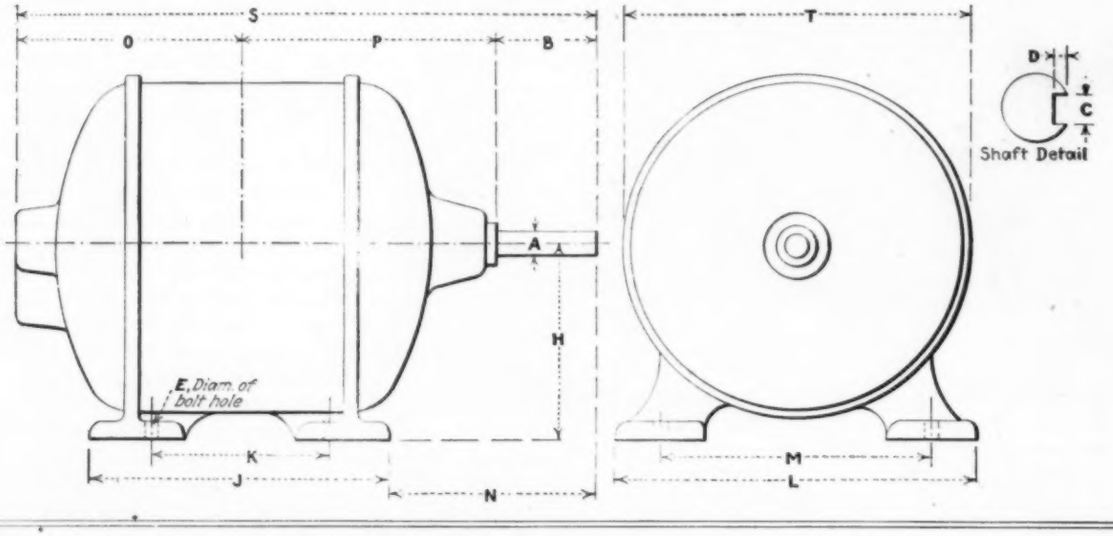
IN THE accompanying table is a list of the principal dimensions of 5-hp. squirrel-cage motors made by the leading manufacturers in the United States. An examination will show how closely these dimensions check with one another and will indicate what minor changes would have to be made in order to have all conform to a single standard. The advantages of such standardization are only too obvious, particularly with the present trend toward individual motor drive.

In this respect, the standardization of shaft extensions and the holding down bolt dimensions should come first. It is also quite desirable that the platform dimensions *M*, *L*, *J*, and *K* and the other dimensions *H* and *N* should be standardized so as to obtain interchangeability. Dimensions *A*, *B*, *C* and *D* are not so important but it is quite possible that they could be agreed upon so as to make interchangeability complete.

In the table it can be seen that the shaft diameters *A* vary between 1¼ and 1⅜ in., the difference being 30 per cent of the smaller figure. Although the figure 1¼ in. appears the most often, the mean size is about 1⅜ in. The variation between shaft extension lengths is not as noticeable, nor so important to standardization. The greatest variation of all occurs in dimension *K*, the axial bolt-center distance. Here the largest figure, 12¾ in., is more than double the smallest, 6 in. The other center-to-center distance *M*, varies by only 50 per cent, however. The variation in dimension *H*, the base-to-center height, shows a difference of 2¼ in. It is simple enough to drill new bolt holes, where a motor is mounted directly on a machine, but variable center heights cannot be taken care of so easily, should the customer specify other than the motor for which the machine was originally designed.

In Germany this standardization has already been put into effect. The suggestion is therefore made for American motor manufacturers to get together in a plan of standardization. The users of electric motors, particularly the builders of all kinds of production machinery, will appreciate such an effort.

Comparative Dimensions of Various 5-Hp. (40 deg. C. Continuous Rating) 2- or 3-Phase, Sleeve-Bearing A. C. Squirrel-Cage Induction Motors



Make	Type	Frame	Shaft Extension A	B	C	D	E	H	J	K	L	M	N	O	P	S	T
Allis-Chalmers†	A R	110-D	1⅜	5	⅜	3/16	11/64	6½	11⅛	8½	12¼	10	....	...	...	....	12¾
Louis Allis	H D	L 61 S	1¼	3¾	¼	⅛	21/32	7¾	9⅛	8¼	14¾	11¾	8 7/16	9 5/16	9 9/16	22⅝	14½
Century	S C	8 B	1½	4½	⅜	1/16	11/32	7	12⅞	10½	13	10¾	8 13/16	9 21/32	9⅞	24 1/32	13⅝
Crocker-Wheeler	Q	13	1½	3¾	⅜	⅛	25/32	7⅝	11½	9¼	14½	12	8¾	9⅝	9⅝	23	14¾
Electro-Dynamic*	A K	131	1⅜	3½	⅜	3/16	11/16	8⅜	8	6¼	16	13½	....	...	...	....	16
Fairbanks-Morse	B	8 C	1 7/16	4½	⅜	3/16	11/32	7 7/16	9⅜	7½	15¾	12½	10 5/16	9 7/16	9 11/16	23⅝	14⅞
General Electric	K T	946	1¼	3¾	¼	⅛	21/32	7	11¼	9¼	14	11¼	8½	9 3/16	9⅜	22 5/16	14
Lincoln	D	212	1⅝	4⅝	⅜	3/16	9/16	6¾	12⅜	10⅜	12⅝	10¼	9	9¼	9 9/16	23 7/16	13
Reliance	A A	22	1¼	3¾	¼	⅛	13/32	6¾	10	8	13	10½	8 7/16	8⅜	8 11/16	20 13/16	13¼
Robbins & Myers	L	630	1¼	3¾	¼	⅛	9/16	7	7½	6	12½	10	10⅜	9 7/16	9⅝	22 13/16	13¼
Star*	A	45	1 7/16	5	5/16	5/32	13/32	7¼	9⅞	7½	14⅝	12½	....	...	...	....	13⅞
Wagner	R P	11T	1⅜	4 11/32	⅜	3/16	21/32	7⅜	12	9¼	15½	15	8 11/32	8¾	8¾	21 27/32	13⅞
Westinghouse	C S	254-C	1¼	3 7/16	5/16	⅛	21/32	6¼	14¾	12¾	13½	10½	6 11/16	9⅝	9⅝	22 11/16	11 9/16

†Roller bearing. *Ball bearing. Dimensions are all in inches.

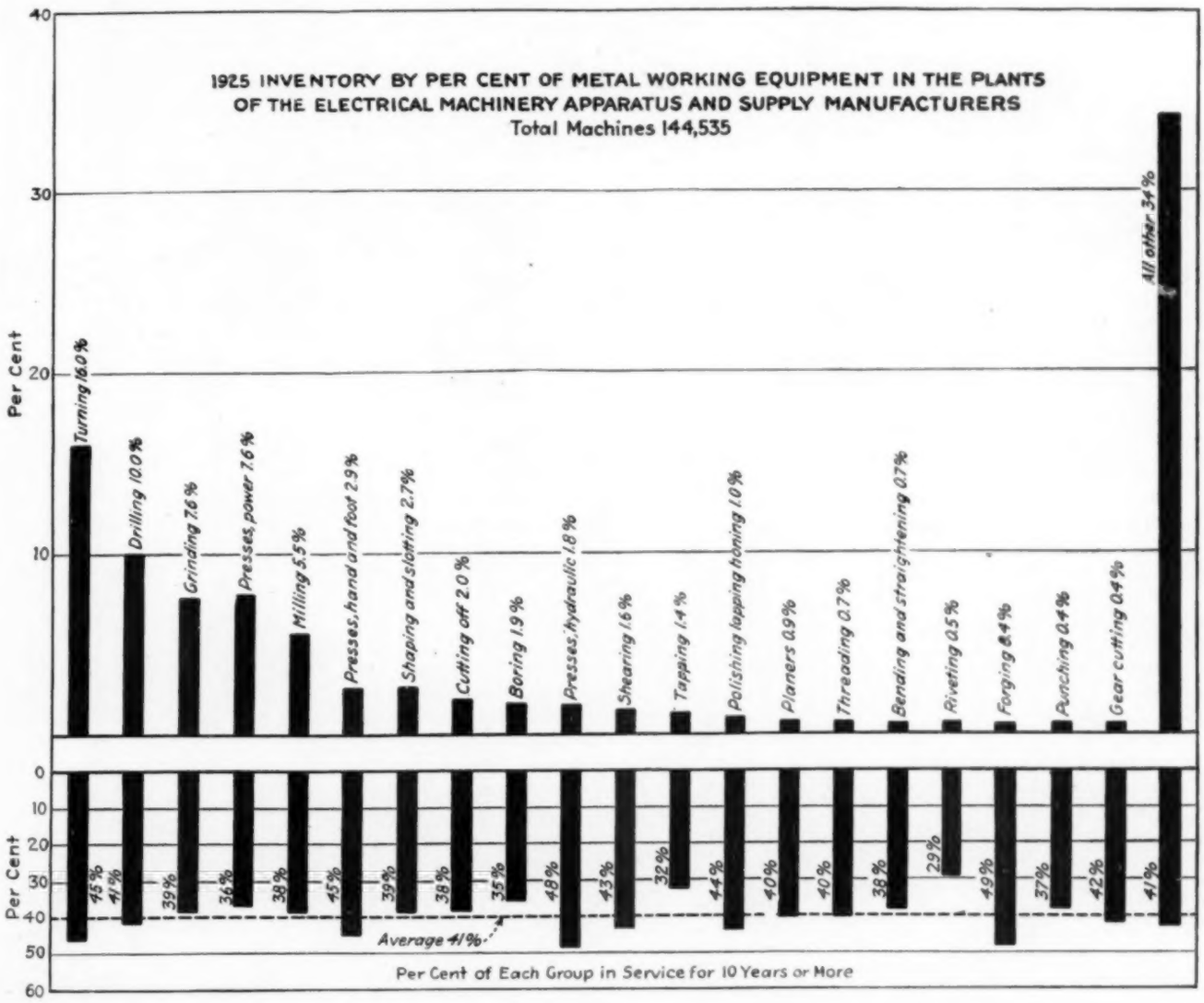
Special Machinery Featured in the Electrical Industry

Thirty-four per cent of the metal working equipment, according to a recent count, cannot be classed under the standard headings

THERE are approximately 144,500 metal working machines in the plants manufacturing electrical machinery, apparatus and supplies. The plants themselves, counting those with six or more men, total approximately 1,150 and employ some 233,700 workers.

Of this total number of machines, nearly 48,000, or 34 per cent are specially built, or specially adapted from a standard design, to suit particular phases of production in the manufacture of electrical equipment.

Divisions of the equipment by operation groups, by relative age of machinery in each group and by names of machines are shown in the accompanying chart and tabulation. The tabulation is made on the form that was used as a questionnaire by the *American Machinist* to the leading manufacturers in the division, in order to get a basis for the totals shown. The U. S. Census of Manufactures provided the means for expansion of the resulting figures to cover the whole division.

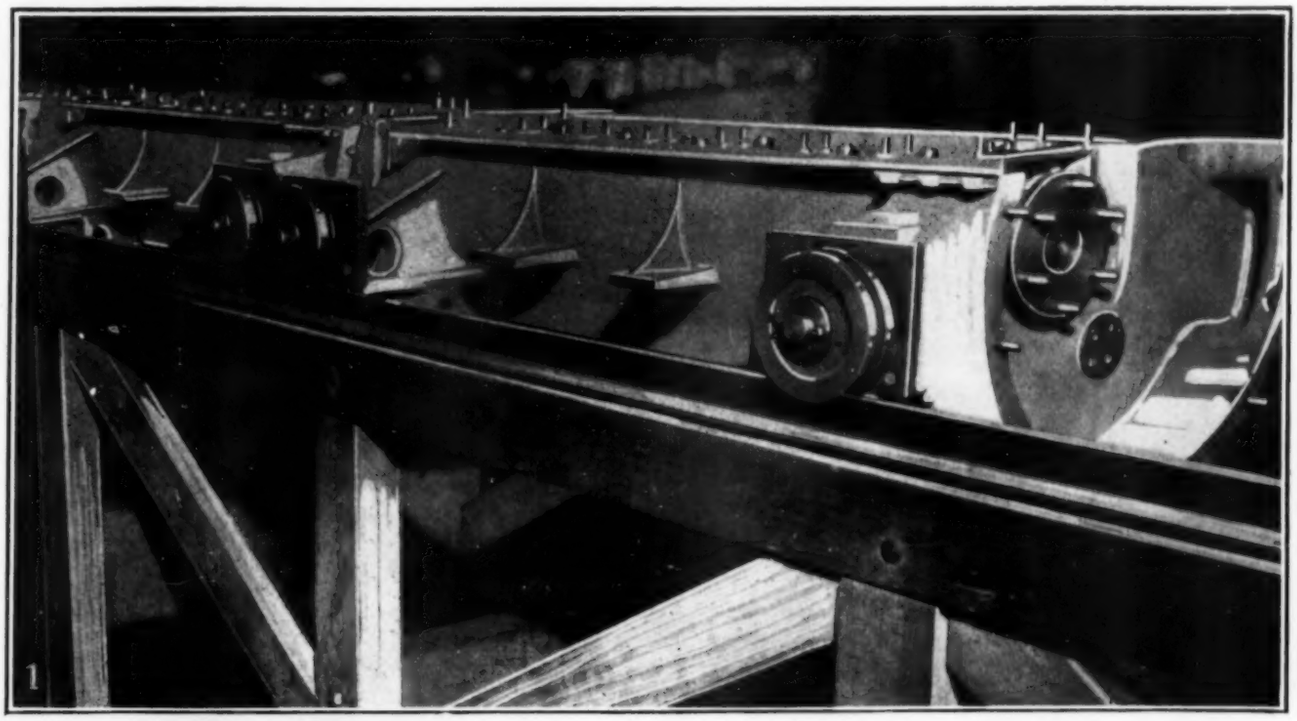

1925 INVENTORY BY PER CENT OF METAL WORKING EQUIPMENT IN THE PLANTS OF THE ELECTRICAL MACHINERY APPARATUS AND SUPPLY MANUFACTURERS
Total Machines 144,535
Per Cent
Turning 16.0%
Drilling 10.0%
Grinding 7.6%
Presses, power 7.6%
Millings 5.5%
Presses, hand and foot 2.9%
Shaping and slotting 2.7%
Cutting off 2.0%
Boring 1.9%
Presses, hydraulic 1.8%
Shearing 1.6%
Tapping 1.4%
Polishing lapping honing 1.0%
Planers 0.9%
Threading 0.7%
Bending and straightening 0.7%
Riveting 0.5%
Forging 0.4%
Punching 0.4%
Gear cutting 0.4%
All other 34%
46% 41% 39% 36% 38% 45% 39% 38% 35% 48% 43% 32% 44% 40% 40% 38% 29% 49% 37% 42% 41%
Average 41%
Per Cent of Each Group in Service for 10 Years or More

METAL WORKING MACHINES IN THE ELECTRICAL EQUIPMENT PLANTS

Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925	Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925
Engine Lathes	3893	8110	Grinding Machines, Floor, No Feed Attachments	2058	4420
Hand Turret Lathes	637	1323	Grinding Machines, Bench, No Feed Attachments	145	408
Power Turret Lathes	642	1950	Grinding Machines, Disk	389	866
Semi-Automatic Lathes	440	1362	Grinding Machines, Belt	128	261
Hand Screw Machines	476	1135	Grinding Machines, Centerless	00	0
Automatic Screw Machines, Single Spindle	879	2495	Polishing and Buffing Machines, Wheel	560	1264
Automatic Screw Machines, Multiple Spindle	408	1192	Polishing and Buffing Machines, Belt	9	64
Chucking Lathes	256	687	Polishing and Buffing Machines, Semi-Automatic	60	114
Multiple Spindle Chucking Machines, Rotary Work	23	87	Lapping Machines	14	18
Multiple Spindle Chucking Machines, Rotary Tools	5	14	Honing Machines	0	0
Speed Lathes	787	1248	Cutting-Off Machines, Parting Tool Type	27	50
Bench Lathes	1740	3045	Cutting-Off Machines, Power Hack Saw Type	357	1287
Tool Room Lathes	279	408	Cutting-Off Machines, Rotary Cold Saw Type	389	890
Wheel Lathes	5	9	Cutting-Off Machines, Band Saw Type	256	537
Axle Lathes	14	32	Cutting-Off Machines, Friction or Hot Saw	9	14
Forge Lathes	5	5	Shears, Knife	673	1588
Hand Milling Machines	550	1374	Shears, Rotary	156	380
Bench Milling Machines	101	265	Shears, Slitting	142	320
Plain (Knee and Column Type) Milling Machines	1003	2723	Nibbling Machines	0	105
Universal (Knee and Column Type) Mill. Mach.	724	1555	Hammers, Steam	50	151
Vertical (Knee and Column Type) Mill. Mach.	422	1323	Hammers, Pneumatic (not portable)	23	50
Lincoln Type Manufacturing Milling Machines	23	51	Hammers, Drop	124	234
Semi-Automatic Type Milling Machines	37	247	Hammers, Helve	5	23
Continuous Mill. Mach. Rotary or Drum Type	69	147	Hammers, Spring	5	5
Planer Type Milling Machines	124	334	Riveting Machines, Pneumatic	32	147
Gear Cutting Machines, Rotary or Milling Type	183	325	Riveting Machines, Hydraulic	5	5
Gear Cutting Machines, Hobbing Type	55	202	Riveting Machines, Steam	0	0
Gear Cutting Machines, Planing or Shaping Type	9	60	Riveting Machines, Power	192	628
Vertical Boring Mills	568	1785	Forging Machines, Hot, Bulldozers	27	55
Horizontal Boring Machines	398	963	Forging Machines, Hot, Forging Machines	50	87
Radial Drilling Machines	675	2380	Forging Machines, Cold Headers, Bolt, Nut, etc.	165	362
Upright Drilling Machines, One Spindle	2136	4150	Forging Machines, Cold, Swaging	73	142
Upright Drilling Machines, Two or More Spindles	720	1778	Bending Brakes	124	339
Upright Drilling Machines, Two or More Heads	96	169	Bending Rolls, Horizontal	170	463
Sensitive Drilling Machines, One Spindle	1268	3178	Bending Rolls, Vertical	5	9
Sensitive Drilling Machines, Two or More Spindles	985	2682	Straightening Rolls	69	156
Sensitive Drilling Machines, Two or More Heads	42	83	Punching Machines	224	575
Two-, Three- and Four-way Drilling Machines	5	23	Combined Punches and Shears	14	69
Tapping Machines, Single	555	1885	Presses, Hand, Arbor	1132	2780
Tapping Machines, Multiple	92	151	Presses, Hand, Light Punch Press Work	248	440
Pipe Threading and Cutting Machines	128	328	Presses, Foot, Light Punch Press Work	468	926
Bolt Threading and Cutting Machines	42	119	Presses, Power, Crank Type	2580	9187
Thread Chasing Machines	37	73	Presses, Power, Toggle Type	105	284
Thread Hobbing Machines	14	27	Presses, Power, Double-Acting Type	50	156
Thread Milling Machines	23	87	Presses, Power, Dieing Type	92	348
Thread Rolling Machines	142	339	Presses, Power Automatic	5	87
Planers	477	1140	Presses, Power, Trimming Presses	114	334
Open-side Planers	23	106	Presses, Power, Forcing, Arbor, Wheel	114	440
Shapers	994	2777	Presses, Power, Baling	9	92
Vertical Shapers	115	389	Presses, Hydraulic, Bending, Forming, Drawing	1068	1965
Slotters	380	697	Presses, Hydraulic, Forging	9	9
Broaching Machines	50	183	Presses, Hydraulic, Flanging	0	0
Keyseating Machines	119	312	Presses, Hydraulic, Forcing, Wheel, etc.	133	500
Centering Machines	92	278	Presses, Hydraulic, Baling	18	46
Grinding Machines, Plain Cylindrical	422	1108	Presses, Hydraulic, Extruding	5	32
Grinding Machines, Universal Cylindrical	252	812	All other machines and miscellaneous	20,669	47,944
Grinding Machines, Surface, Reciprocating	453	1305			
Grinding Machines, Surface Rotating	101	362			
Grinding Machines, Internal	42	288			
Grinding Machines, Cylinder	87	330			
Grinding Machines, Cutter	275	884	Total	59,145	144,535

Automotive Production

Assembling the Pierce-Arrow "80"



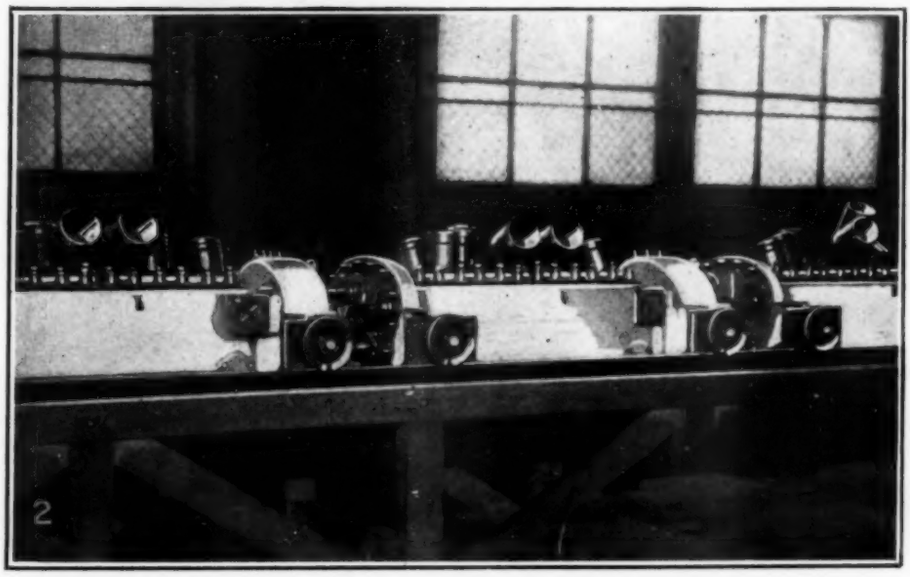
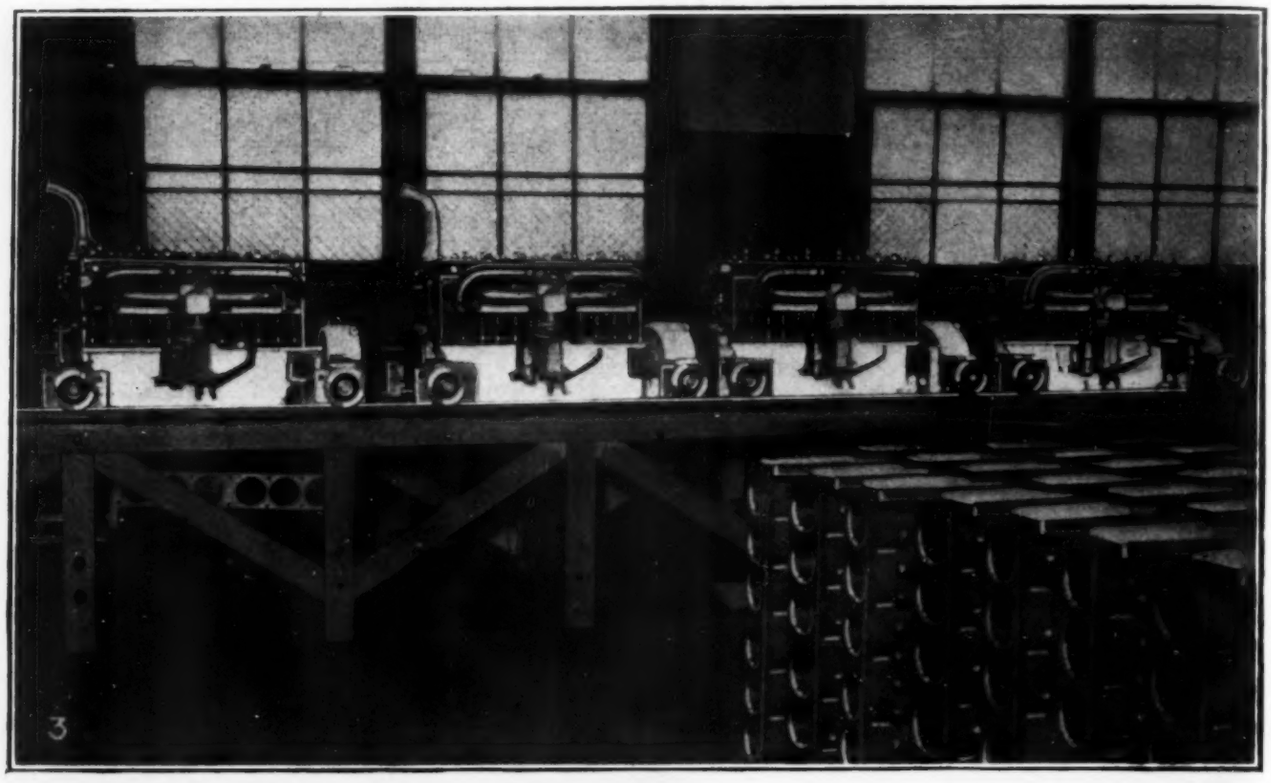


Fig. 1—Grooved truck wheels are bolted to engine supports of crankcase before assembly starts. The wheels run on steel angles and are not removed until engine is ready for chassis

Fig. 2—Part of assembly line with engines on their way toward completion. The crankcases have been turned over and connecting rods, pistons, valve lifters, etc., are now in place

Automotive Production



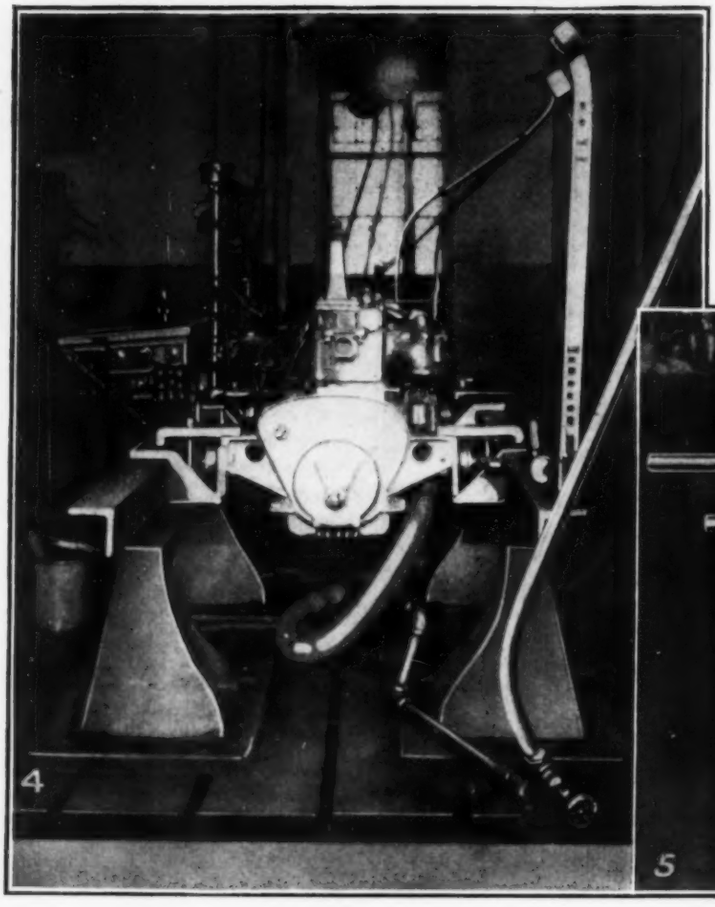
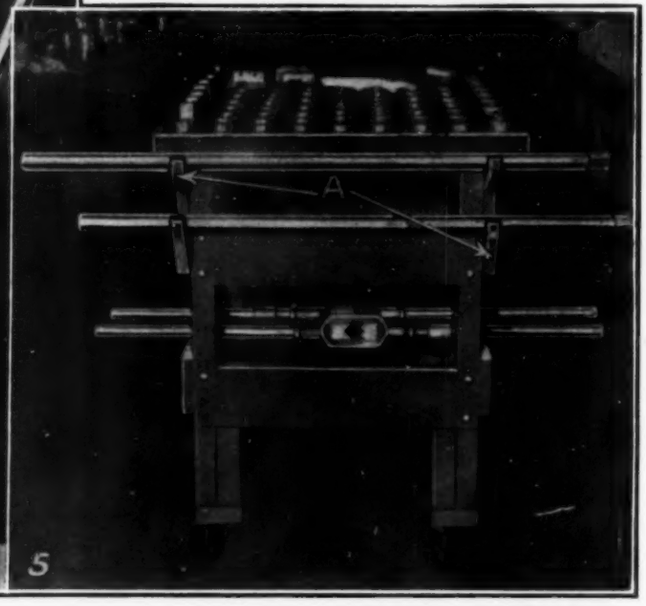


Fig. 3—End of assembly line. Carbureters, manifolds and plugs in place

Fig. 4—Engine on test stand for running under its own power

Fig. 5—Stand for holding Martel reamers used in final sizing of bearings



John Dick Investigates Unlimited Service

By F. M. A'Hearn

The sales engineer is paid to render service to customers—How to kill the salesman's time—Taking advantage of the salesman's knowledge

JOHN DICK sat in his office, his morning rounds completed. Everything in apple-pie order at the Dick Pump Works. John could hear the pleasant jingle of the foundry rattler and the rat-tat-tat of the chippers preparing castings for the first lap of their journey in service life. The machine shop, running neck and neck with the other departments, was ready for the foundry products. The soothing drone of a saw in the pattern shop was merged with sounds of conversation. John looked up as his two old friends, Jim Kelly, the machine tool man, and Bill Weston, master mechanic, entered.

Greetings exchanged and guests at their ease, shop talk followed. Business at the pump works was good, John assured his friends. Weston added that the coal mines along the C. & G. W. were giving the road a good tonnage, and, better still, he had his motive power in shape to handle peak traffic. Kelly stated that the machine tool trade was improving; also, that he would be pleased to furnish John Dick or Bill Weston with any tools that their expanding business needed.

"Jim," said Bill Weston, "Looking forward to our next year's budget I am wondering how much you machine tool men are going to boost prices on the strength of the increased cost of your raw materials. Seems to me you could shave a little on selling costs to offset slight increases in the manufacturing end."

"Often thought about the same thing myself, Bill," commented John Dick. "Kelly comes into the pump works, looks around a bit, then he comes back in here and shows me a few errors in my ways. While ago he sees one of the boys making a machine vise and asks me why I don't build machine vises as a regular line if I think I can build them better and cheaper than I can buy them. Goes up to your place and puts you blushing because you are making your own staybolt taps and staybolts. He was right about the machine vise business, however. I checked up very closely and was surprised at the expense of some of my pet economies. Here and now, Jim, I am going to express thanks. Some time," with a wink at Bill, "let's hear you show us how to buy your machine tools for less money."

"You tell me that my suggestions have saved for you some money?" asked Kelly. "How about the staybolts and taps, Bill? Did you buy a trial order and was any saving shown over the home product?"

"Aside from the question of dollars and cents in comparative costs, Jim, I believe that a really greater saving exists in the better service from the purchased product. Taps are uniform in size and lead.

Machine tools a la cafeteria

"Very good, Messrs. Dick and Weston. Your savings were effected by methods, not by machines. Now to comply with your request and show you how we can reduce the cost of our product.

"You men saw machine tools in the making. Both of you are practical workmen. Have you any suggestions to offer in regard to manufacturing? No? Very good. It appears that I must depend on your help in a money-saving campaign in the sales end alone. Oddly enough, I have often tried to vision the far reaching benefits of the customers co-operation with the sales department. Just imagine the money that could be saved in America annually if each and every purchaser of machine tools would care to consider a plan to reduce selling costs. I am surely glad to have this opportunity to unburden my mind in the matter."

"Imagine this is going to be good, Bill." commented John Dick. "Something like one of these new 'Serve-Self-and-Save-Some' stores. I can send a motor truck and a gang of men down to the machine tool plant, drive right in, spot the truck beside the tool I wish to purchase, load her up, receive a ticket from the inspector that has just put his Okeh on the machine, walk up through the rail in gangway to the young lady at the turnstile, lay down my purchase ticket and cash, cafeteria style. The sale is completed once the cash hits her desk. She rubber stamps the ticket, tears the customer's coupon at the dotted line, hands me my half coupon, together with 'Thank You' and a smile. I step forward through the turnstile and am on my way back to Woodland with my new 42-in. lathe before you know

what happened. We carry out the machines as fast as they are completed, therefore no warehouse or storage space is required. We pay cash, therefore no bad accounts for the machine tool builder. How's my sales plan Jim?"

"Wonderful, John, although you do not hit upon the plan I have in mind." Kelly answered. "Besides, you do not cover enough territory. Before you decided to buy that machine you knew that our shop built just such a tool. How did you know? Through our advertising. Did you buy then? No. I came up one day and showed you that your old machine was due for retirement. I also showed you that you could make the new machine pay for itself. Now I propose to show how to help me to help you. First, I wish to ask a question. Bill, would you think it good business for your company to have you travel fifty miles to perform an errand that could be done at a cost of say two cents? I am considering your salary for a day as well as hotel and traveling expense."

"Certainly not."

"Why expect me to then?"

"Don't expect you to."

"Possibly I don't do it, but it is done every day. Allow me to explain. You men have told me that the visits of the machine tool representative to your plants means a saving for you, although you bought nothing from me on the occasion of my visits. I am glad, however, to have rendered you a service. From a selfish viewpoint alone, I could assume that unless your concerns operated at a profit you could not find money to buy my goods. However, I do not look at it in that light. We aim to serve our customers. One of our ways is in doing just what I did for you men. In our business we pass from shop to shop daily. Many of us are former shop men; men who have held positions similar to your own, Bill. This applies particularly to our railroad department. I am glad to know that Bill's changes in the matter of taps and staybolts have saved him many times the cost of my day's time and the expenses involved in visiting his plant. Possibly it would equal the cost of a new machine per year. Nice gift. That day's costs to our concern must of necessity be included in making up the selling price of our goods.

"Suppose on the other hand that all of our class discontinued calling upon the trade. When you felt that you must have a new machine you would either write to or call at other shops until you located a tool something like you want. You decide, however, that a larger swing or some other deviation from what you see would be better suited to your need so you start another hunt. So it goes until you get, as nearly as you can, a machine suited to your purpose.

Indirect Costs

"As matters now stand I know very nearly when you mention the purchase of a tool what you will require. I hand you a photo of that tool,—say in the X. Y. & Z. shop. The tool is shown in operation in a railroad shop. I can tell you how the machine is located and why it is so located. All this preliminary work is of no direct cost to you. The indirect cost, in the price of the machine, is probably one-tenth of what it would cost you yourself or some equally competent official to do the scouting.

"We are glad to continue in this manner until better means are devised to do the same work. We feel, however, that the customer can double our field of usefulness, or, if you please, can reduce the cost of selling our product. I'll point out a difference in the standing of two men in their relations to you.

"Suppose one of your foremen calls you and asks for an appointment with you. You will probably answer, 'Come over in five minutes and I'll see you.' You consider it important to see that man promptly. You would not care to have him waiting outside your door for an hour or two. Certainly not. Should a salesman have to wait an hour or two before you see him? You may consider that he has all day to wait and that waiting is part of his job. Possibly he is a stranger and you are too busy to see him at all. In that case his day may be lost so far as results are considered and he would have accomplished just as much had he mailed you his card from the home office. In other words, everything that he has accomplished that day could have been done for the outlay of one lone two-cent stamp. Understand now, fellows, I have no complaint to make concerning the treatment I receive at the C. & G. W. shops. I know the boys and am always made welcome. On the other hand, I happen to know that many supply company men lose a lot of time against their own wishes. The time is spent in getting to see the man directly interested in their product.

Keep Him Moving

"You men and all men in similar capacities can save the salesman's time and incidentally lower the cost of his product to you by keeping him on the move when he calls at your plant. Here is one way how not to do it. For example: George Shank has an adjustible reamer to market. You, Bill, being the reigning power at Coaltown, are the man he must first see to obtain permission to see someone directly concerned. Shank got into town last night on the 8:15 train. He went to bed after closing up his day's affairs as best as he could. Out early this morning. He wishes to get his reports typed. The public stenographer will be at the hotel from 9 a.m. to 5 p.m., so says the card. Shank knows that 9 a.m. means almost anything except that the stenographer will not report before 9 a.m. Shank knows that your shop goes to work at 7 a.m. and that your tool room foreman is on duty at that hour. He would rather get down to the shop at that time and get going than he would at a later hour. Knowing that he should see you first he arrives say at 8:50. A clerk, or possibly an office boy, asks him his business. He sends his card in to you and is told that you are engaged and that he may wait if he wishes to see you. Sometimes he is offered a seat. Often not.

"Some member of your own staff wishes to see you on an important matter before you have finished with the mail. This sets Shank back a few minutes longer. By ten o'clock you squeeze in enough time to admit him. Three minutes convinces you that his reamer has merit. You have your clerk write out a pass admitting him to the shop. He is to present this pass at the general foreman's office. Arriving at that office he is told that his man is 'out in the shop somewhere.' 'Any idea when he will be in?' Shank inquires. 'No.' Everybody has his own affairs to look after; therefore, no one seems to know where the boss can be found. However, judging from what I have seen and heard in your office, should you chance to phone for him he could be

located in mighty short order. Shank may spend anywhere from two minutes to an hour or more before he sees his man.

"The general foreman knows that you are interested in the reamer, otherwise you would not have referred the matter to him. He questions Shank concerning certain details of the tool until he has familiarized himself with what it's all about. He then refers Shank to the tool foreman who may be the man whose recommendation will settle the matter. Should all things work well, Shank may get finished before lunch. Again he may not. I can honestly state to you that I started in a certain city office at 8 a.m. After securing permission to visit the plant, fifteen minutes' ride from the city office, I reached the shop superintendent's office at 10:30 a.m. Saw him at 11:45 a.m. and was sent to the shop office. The general foreman was not in his office when I arrived, although he was expected back before lunch. I stayed the noon hour in the shop and met him at 1:15 p.m. Shank or Jim Kelly, either one, may have business in another city next day. Business of getting back to the hotel and persuading the little lady to get out a bunch of letters before 5 p.m. means that the supply man may have one or two hours in the shop. In some cases ten minutes is plenty, in others, deducting interruptions, two hours is not too much. However, you can see how the day is spent.

Keeping in Touch

"I have often spent several hours with shop foremen at their own request. Sometimes it would be in giving information needed to aid in getting out work. Again, there might be some difficulty with a machine or tool that required some time to locate and correct. You can see that, in cases of this nature, your company is the one profiting by the service given. You can also see that utilizing the sales engineer's time to the fullest extent is important to you. Our services are not always asked for to the extent that we should like to see them sought. We are always glad to talk over tool performances with our customers and to suggest ways and means to get maximum output from our products.

"By keeping in touch with your work and conditions we try to forecast what your needs will be say five years hence. We are not only trying to build our tools to handle the locomotives of today; we must to a certain extent anticipate our customers' needs. Many details of our latest railway shop tools are designed with this object. We help ourselves when we help you.

"Some service demands are excessive. When you ask me to quote on a machine you also ask other tool men for prices. Proposals are compared and an order placed. Nothing said that the tool company should 'bell-hop' the machine for an indefinite period. Some seem to expect it, however. In one case I remember our people sold the P. D. Q. Co. a planer. The machine had an a.c. motor and a countershaft on top of the housings. We had a new man in that district who had worked several years as a machinist. He was told to call at the P.D.Q. shop and see how the tool was performing. He called one afternoon and received a rather unfavorable report. As the afternoon was too far gone to allow him to investigate the complaint he promised that someone would attend to it in the near future. He arranged to call later. Upon his arrival he found a grease-soaked belt in sad need of shortening. The belt was narrow and was crossed to lead away from the tight pulley. He had the belt cleaned, shortened and properly crossed. Everyone satisfied. In fact the operator broke a pair of tools in an attempt to stall the machine. No doubt our man did a good job on the belt, but I fail to see why we should have a man spend a day doing it. That's no worse than sending a man to another plant to investigate a complaint concerning a pump on a new screw machine. When he arrived he was told that the coolant did not flow steadily and splashed. He had the tank filled—that was all.

"All shops do not treat the supply man in the manner I have described. Many of our friends make it a point to learn the supply man's errand when he presents his card. Should it be that his business is not of interest to the concern or that the party he wishes to see is absent, he is so advised at once and is at liberty to go elsewhere.

"I once remarked to a certain shop executive that a salesman lost no time in his shop, at the same time thanked him for the courtesies shown. His answer was that the supplyman looked the same to him as any other man in the shop. Pay was going on all the time. The more work he could accomplish during his call the greater return the customer received.

"You men, as purchasers of our products, can reduce their cost to you by utilizing our services properly. Remember that the time of our sales force is valuable and that traveling expenses are high. We wish you to benefit by this expenditure. When a man spends the greater part of a day to hand his card to the office boy, or to tighten a belt, neither you nor we will benefit as we should by his efforts. Again, that hour he spends in the outer office waiting for you to sign a pass to admit him to the shops may mean a train missed or a stop over night in your town. It would appear irregular for me to preach this doctrine. I have only given my views in answer to your questions. You men, if you think I am right, might use your influence in your own plants and among your friends to help the supply man. They could double their day's work and reduce sales costs proportionately. At present in your own case the verdict is, 'Not guilty, but pay the costs.'"

Specifications for the Small Shop

By G. B. Stuart

STANDARDIZATION is something that the small or medium-sized shop often thinks about, but just as often thinks that it cannot afford to do because of the engineering overhead that it might take to initiate. In the case of materials purchasing, this is especially true. The big organization lays out a program of working specifications for the purchase of materials and supplies, but the smaller plant cannot afford to carry the technical staff to do such work.

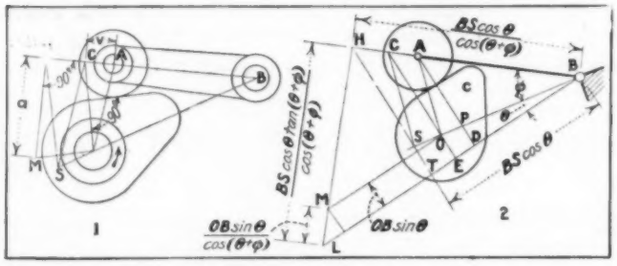
Then why not utilize the work already done by the Federal Government in this respect as a basis for the specifications of the average inductrial plant? The Federal Specifications Board analyzes the varied materials requirements of the government departments, shops, and arsenals, and the resulting specifications are generally well-considered technical outlines of the proper material to cover the average requirements. These specifications cover hundreds of items that enter into the requirements of the average machine shop, and are already being manufactured and probably stocked for government requirements. Copies of these specifications could be had for the asking.

Graphical Analysis of Circular-Arc Cams—Discussion

By Prof. G. L. Guillet
Pennsylvania State College

I HAVE read, with interest, the remarks of Mr. Schreck under the above title on page 322, Vol. 66, of the *American Machinist*, and note that he verifies the accuracy of the construction given in my article when applied to mechanisms with followers having straight-line motion. That a lack of agreement exists between the results he obtains by the ordinary tangent method of analysis and by my graphical methods, when applied to pivoted follower cam mechanisms, really needs little comment on my part. As he states himself, he is applying these constructions to a pivoted follower, whereas they were derived and specified for followers having rectilinear motion. The constructions of Figs. 8 and 10 of my articles are those he has employed in connection with his cam. Neither of these will produce exact results with a pivoted follower. Study of the proof of Fig. 10 construction on page 715, Vol. 65, shows that the expression for the displacement applies to motion along a radial line from the cam center, and is incorrect where the roller center moves along any other path. The same applies to the proof for Fig. 8, page 673, of the same volume.

In my two articles, the cam mechanisms with rectilinear follower motions were the main issue, and this type, I believe, was covered completely. Brief mention was made of the pivoted-follower type, one example only, Fig. 12, being shown in connection with this variety, and that having a restricted application to special "toe" conditions. The construction shown in this figure is exact as regards the velocity, but an approximation as regards the acceleration. The error



Figs. 1 and 2—Graphical determination and proof of velocity and acceleration of a pivoted follower against a flat-surfaced cam

in the latter is not very large with the usual proportions for the ratio of roller lift to follower arm length, and it diminishes as this ratio diminishes. Similarly, for exact velocity but approximate acceleration results, we may apply the constructions of Figs. 6, 7, 8, and 9 to the pivoted follower, provided that all are modified in the same way as is Fig. 12 compared with Fig. 6, viz., by taking the line *OC* parallel and the line *OD* perpendicular to the follower arm. Had this modification been followed out by Mr. Schreck, he would have obtained deceleration values somewhat above, instead of below, the true values. In no case, however, can exact results be obtained for the pivoted follower by this method.

It is not my intention to give the impression that *approximate* graphical results are the best that can be found for the pivoted follower by this system of analysis. The two constructions appended are believed to be exact. Taken together, they cover the case of the pivoted roller follower used in connection with flat or circular arc cam profiles.

The graphical velocity and acceleration construction for a flat-surfaced cam with pivoted follower is shown in Fig. 1. After joining *OA* and *OB*, draw *OC* perpendicular to the cam face and from the intersection at

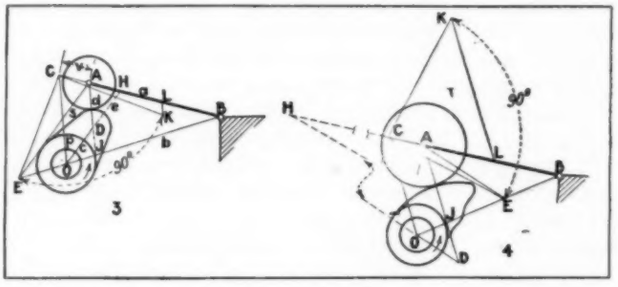


Fig. 3—"Toe" condition of circular-arc cam with pivoted follower. Fig. 4—"Flank" condition of same cam

point *C* with *AB* produced, draw *CS* parallel to *OA*. From the intersection of *CS* with *OB* produced, draw *SH* parallel to *OC*. Line *HM* is drawn perpendicular to *BAH*, and *OM* perpendicular to *OC*.

Then it may be proved that

$$\text{Velocity of roller center} = \frac{\omega_c \times AC}{12} \text{ ft. per sec.}$$

$$\text{Tangential acceleration} = \frac{\omega_c^2 HM}{12} \text{ ft. per sec.}^2$$

Where ω_c equals angular velocity of cam in radians per sec. and *AC* and *HM* are measured in inches when the diagram is full size.

The proof is shown in Fig. 2, which is constructed in the same way as Fig. 1. In addition, *AD* is drawn perpendicular to the cam face and *HM* is produced to meet *BL*, which is drawn parallel to the cam face. Angles ϕ and θ measure the angular displacement of the follower and cam from a fixed line. Point *P* is the instant center of the cam with respect to the follower arm.

$$\text{Hence } \frac{\omega_f}{\omega_c} = \frac{OP}{PB} = \frac{AC}{AB}, \text{ or } \omega_f = \omega_c \frac{AC}{AB}$$

If V_f equals linear velocity of follower roller center,

$$\text{then } V_f = \omega_f \times AB = \omega_c \frac{AC}{AB} \times AB = \omega_c AC.$$

$$\text{The acceleration of the roller center} = \frac{dV_f}{dt} = \frac{\omega_c d(AC)}{dt}$$

Let us evaluate $d\ (AC)$ from the figure

$$\frac{AC}{DE} = \frac{AB}{DB} \text{ or } AC = \frac{DE \times AB}{DB}$$

$$DB = AB \cos\ (\theta + \phi)$$

$$\therefore AC = \frac{DE \times AB}{AB \cos\ (\theta + \phi)} = \frac{DE}{\cos\ (\theta + \phi)} = \frac{EB - DB}{\cos\ (\theta + \phi)}$$

$$= \frac{OB \cos\ \theta - AB \cos\ (\theta + \phi)}{\cos\ (\theta + \phi)} = \frac{OB \cos \theta}{\cos\ (\theta + \phi)} - AB$$

By differentiation $\frac{\omega_c d(AC)}{dt} = \frac{\omega_c d}{dt}\left[\frac{OB\cos\theta}{\cos(\theta+\phi)} - AB\right]$

This expression can be reduced to the form

$$\omega_c \cdot \frac{d\theta}{dt}\left[\frac{OB\left(1+\frac{d\phi}{d\theta}\right)\cos\theta\tan(\phi+\theta)}{\cos(\theta+\phi)} - \frac{OB\sin\theta}{\cos(\theta+\phi)}\right]$$

From the figure

$$\left(1+\frac{d\phi}{d\theta}\right) = 1+\frac{\omega_f}{\omega_c} = 1+\frac{OP}{PB} = 1+\frac{AC}{AB} = \frac{BC}{AB} = \frac{BS}{OB}$$

since P is the instant center of the cam and lever.

$$\therefore OB\left(1+\frac{d\phi}{d\theta}\right) = BS$$

Our acceleration expression reduces to

$$\omega_c^2\left\{\frac{BS\,.\cos\theta\,.\tan(\phi+\theta)}{\cos(\theta+\phi)} - \frac{OB\sin\theta}{\cos(\theta+\phi)}\right\} = \omega_c^2 \times HM$$

notation on the diagram indicates the method of making the last step in the proof.

When we have a pivoted follower bearing against that part of the cam formed by a circular arc the construction given above must be modified. In Fig. 3 is shown a "toe" condition and in Fig. 4 a "flank" condition. The same description of construction applies to both figures.

Point D is the center of curvature of the cam profile. Join OD, AD and OB and draw OC parallel to AD, and AE parallel to OD. Join CE and with C as a center and CE as a radius swing a 90-deg. arc to CK. Line KL is drawn parallel to AD, and OD is produced to meet AL at H.

Then it can be shown that

Linear velocity of roller center $A = \frac{\omega_c^2 \times AC}{12}$ ft. per sec.

Tangential linear acceleration =

$$\frac{\omega_c^2}{12} \times LC\left(\frac{AC}{AB} - \frac{OD}{DH}\right)$$

When the quantity in the parenthesis is positive, acceleration is indicated; where negative, a deceleration.

A graphical construction can be found to reduce the quantity $LC\left(\frac{AC}{AB} - \frac{OD}{DH}\right)$ to a single length, but I have found it easier to scale off these distances (two of them are constant for all positions of the cam) and make the simple calculation required, than to carry out any equivalent graphical construction that I have been able to devise.

Proof of the above statement follows:

Referring to Figure 3, a, b, c and d form a quadric crank chain. Part of OC is denoted by p and part of AE by s. Since OC is always drawn parallel to AD, the figure d, c, p, s, is always a parallelogram and may be regarded as made up of links of fixed lengths. The instant center of p with respect to a is found at E. Considering the velocity of C (as a point on p) with respect to link a

$V_c = \omega_{pa} \times CE = \omega_{pa} \times CK$, in a direction along CK.

Since KL is parallel to CO, the velocity of the point C (regarded as the intersection of p and a) is equal to

$$\omega_{pa} \times CL \qquad (1)$$

The point C is found by the same method in Figs. 2 and 3 and the proof that $V_A = \omega_{cb} \times AC$ is the same for both.

The acceleration of the roller center $A = \frac{d(V_A)}{dt}$

$= \omega_{cb} \times \frac{d(AC)}{dt}$

$= \omega_{cb} \times$ rate of change of length AC

$= \omega_{cb} \times$ velocity of the point C along AC

$= \omega_{cb} \times \omega_{pa} \times LC$ from equation (1) (2)

But $\omega_{pa} = \omega_{da} = \omega_{db} + \omega_{ba} = \omega_{db} - \omega_{ab}$ (3)

For the links d, b, c, the instant centers are at O, D, H.

$$\frac{\omega_{db}}{\omega_{cb}} = -\frac{c}{e} \text{ or } \omega_{db} = -\omega_{cb} \times \frac{c}{e} = -\omega_{cb} \times \frac{OD}{DH} \qquad (4)$$

For the links a, b, c, the instant centers are at O, J, B, and

$$\frac{\omega_{ab}}{\omega_{cb}} = -\frac{OJ}{JB} \text{ or } \omega_{ab} = -\omega_{cb} \times \frac{OJ}{JB} = -\omega_{cb} \times \frac{AC}{AB} \qquad (5)$$

Substituting the values of ω_{ab} and ω_{db} from equations (4) and (5) in equation (3) and then putting in the resulting value of ω_{pa} in equation (2), we obtain finally

Linear acceleration of $A = \omega^2_{cb}\left(\frac{AC}{AB} - \frac{OD}{DH}\right)$ in which ω_{cb} is the angular velocity of the cam to the frame previously denoted by ω_c.

Foremen's Luncheon Conferences

By William J. Fisher, Jr.

THE *American Machinist* has printed some splendid educational articles on the "Foreman Fraternity" and I believe it might be of interest to describe the methods used in the engineering department of our plant to promote a close relationship among the foremen.

Every two weeks we meet at 12 o'clock in one of the dining rooms of the plant where a full dinner is served to about twelve of us free of charge. At the dinner no business of any kind is taken up but the conversation is generally about some interesting subject or about some public event, so that an enjoyable time is had. After the dinner there is smoking for a few minutes.

When the meal is finished and every one is ready to sit back, the chairman calls the meeting to order and the secretary reads the minutes of the previous meeting. The chairman then asks the foreman if any of them have a subject that they wish to be discussed. Some problem, such as a new method of production, methods of handling men, news from the trade journals or changes in equipment, will be raised and a general discussion held. The secretary, in the meantime, takes notes to be brought up at the next meeting.

Should some problem arise or some new way of increasing our output be brought up, the chairman appoints a committee to report its findings at the next meeting.

We have found these luncheons very beneficial to all of us and, since we have held them for several years, they can hardly be called an experiment. If any of the foremen own twin sixes bodied by Christopher Columbus and wish to go home for their lunch, they are welcome to do so but are expected to attend the business meeting and take part in it.

One feature of the meetings which seems to have added to their success, is that the discussions are not clearing houses for our own faults. No foreman comes to the luncheon with the feeling that his failures are about to be exposed and he can enter the doors in a frame of mind that will contribute to the constructive manner of their operation.

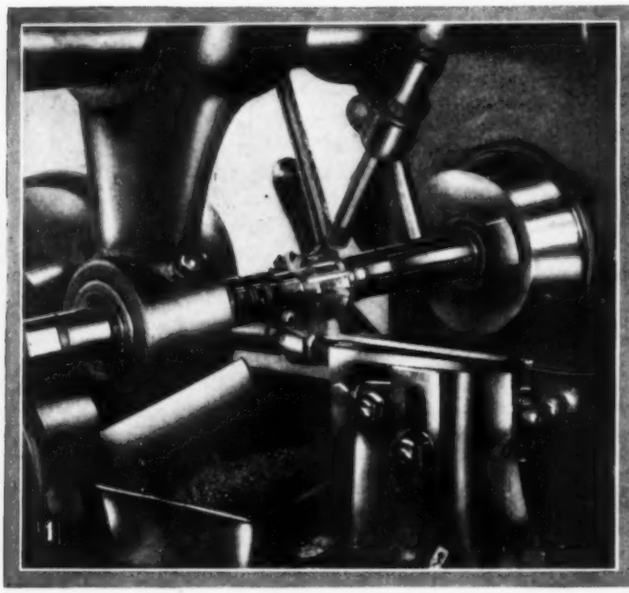


Fig. 1—Milling a three-fluted counterbore. A different form cutter is needed for nearly every size

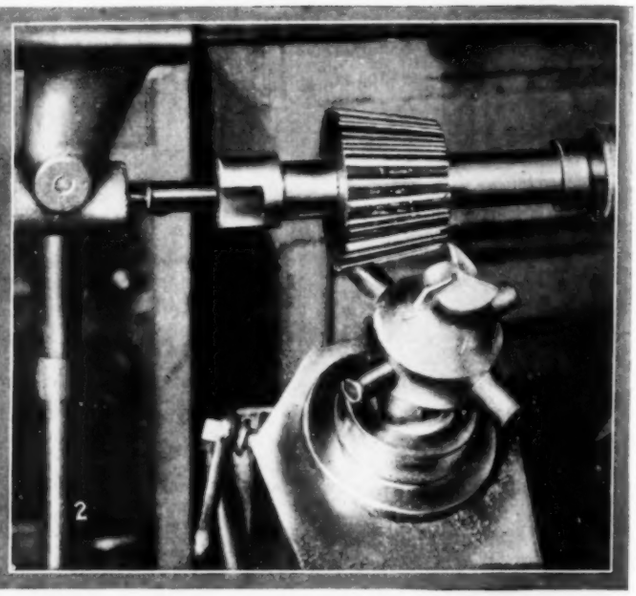


Fig. 2—Backing-off a three-fluted counterbore

Counterbores in the Making

Photographs by courtesy of the Gairing Tool Co.
Detroit, Mich.

Fig. 3—Indexing fixture for fluting three counterbores at once. Note arbor supports *A* between cutters and latch *B* on index

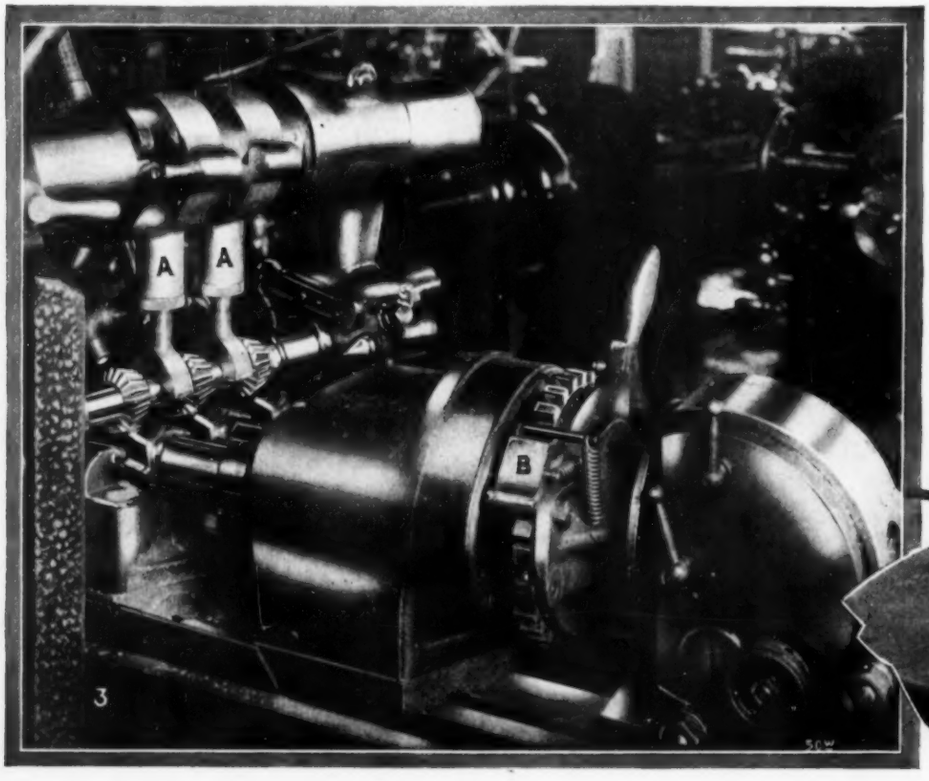


Fig. 4—Drilling holes for locking ball in holders

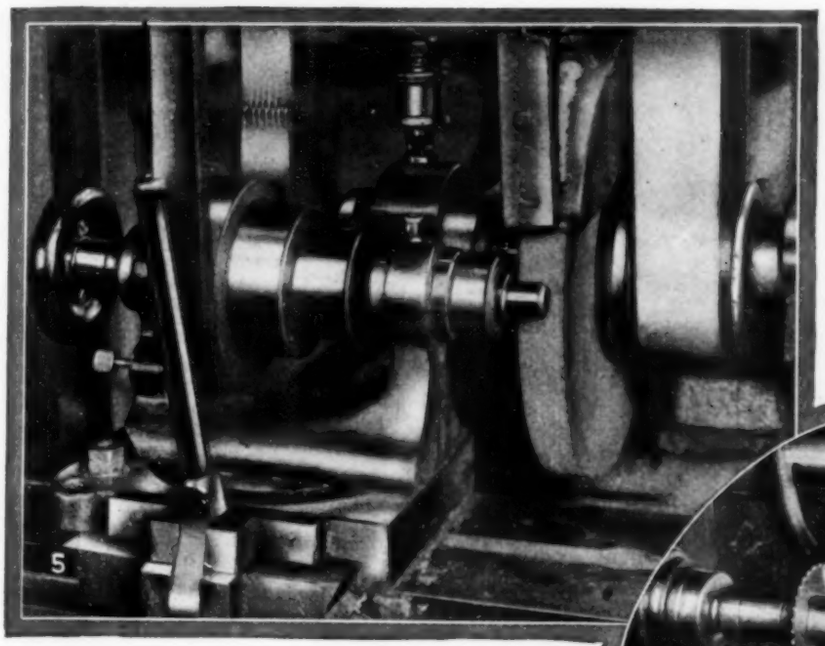
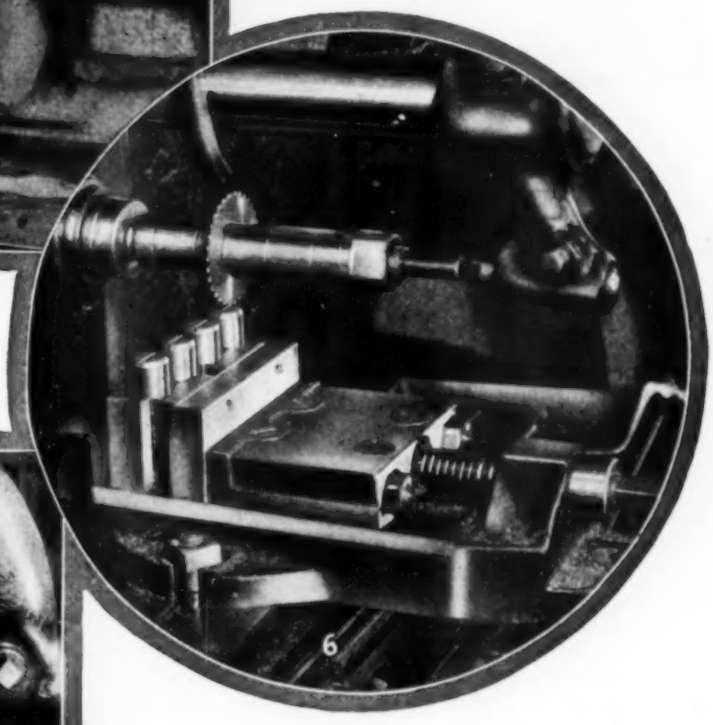


Fig. 5—Special workhead taken from bench lathe and fitted to hold pilot heads for the final finish by grinding

Fig. 6—Cutting screwdriver slot in pilot heads to make it easy to remove and replace. The milling machine vise is fitted with self-adjusting jaws of the floating type to grip four pilot heads at once



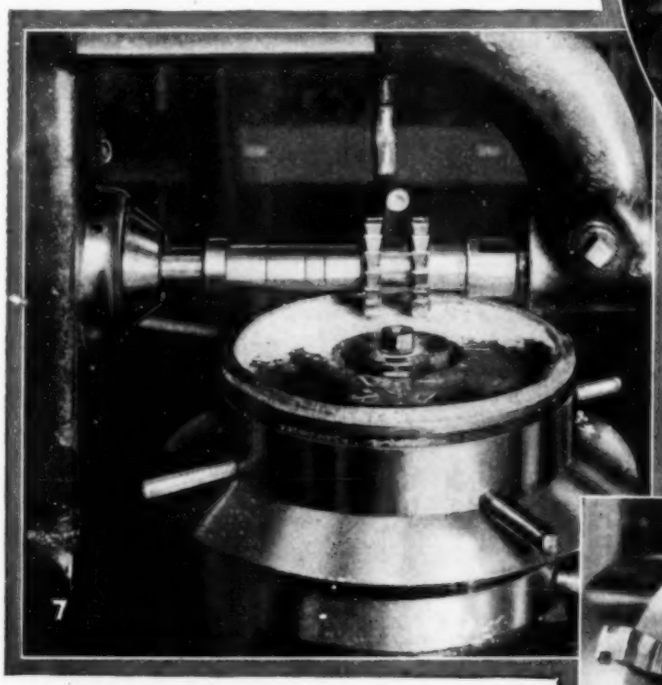


Fig. 8—Grinding hole for pilot in large counterbore, after truing the counterbore in chuck. This insures the pilot being true in hole

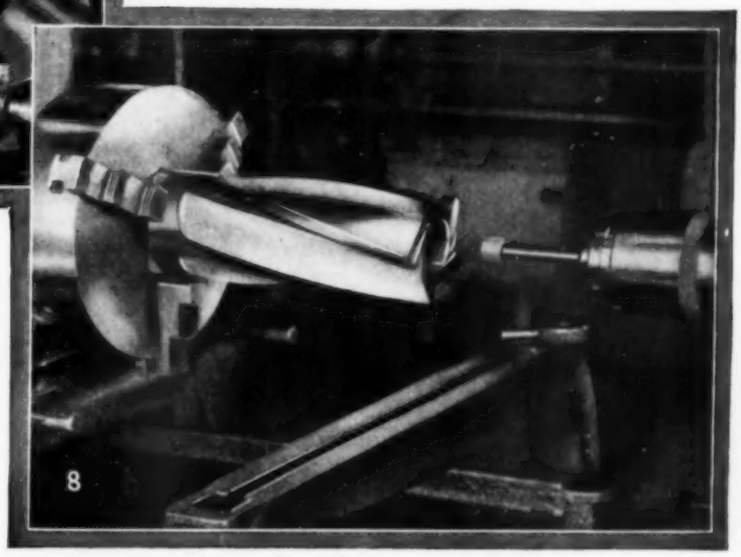


Fig. 7—Indexing fixture for milling hexagon heads on the ends of cutters. These hex heads fit into sockets in the body of the counterbore itself, and drive the cutters with a positive grip. The sockets or recesses are cut in the body with a wabble boring tool

The Plane that Flew to Germany

The plane that carried Clarence D. Chamberlin, pilot, and Charles A. Levine, owner and passenger, to Germany on June 4-6 is pictured above. Even before this historic flight of almost 4,000 miles, the plane, known as the Wright-Bellanca and named "Columbia," had earned itself a reputation. On April 12-14, 1927, this seven-seater cabin monoplane broke existing records for sustained flight by remaining in the air over 51 hours under the guidance of Clarence Chamberlin and Bert Acosta. The ship at that time was equipped the same as for the transatlantic flight. In fact, before Chamberlin and Levine hopped off, the plane had already flown about 25,000 miles.

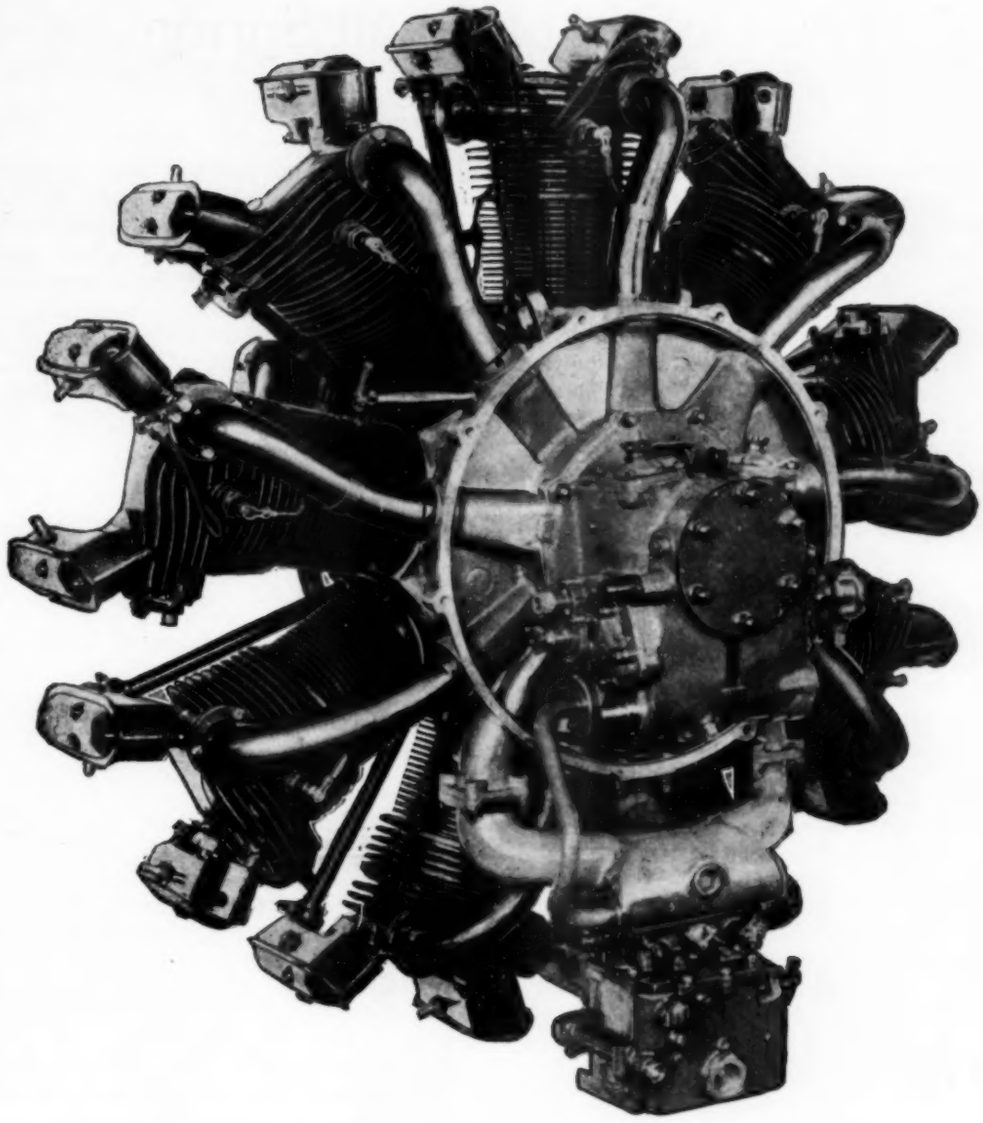
In addition to two wing tanks, carrying 63 gallons of gasoline, total, there was installed in the passenger space an auxiliary 322-gallon tank for gas, and under the pilot's seat an 18-gallon oil tank to supplement the standard 5½-gallon tank built into the fuselage directly behind the Wright "Whirlwind" motor. Fourteen 5-gallon cans of gas made up the total of 455 gallons in the plane when it left Roosevelt Field, Long Island. The ship weighed light, 1,790 lb., and when fully loaded with pilot, passenger and fuel about 5,450 lb. During the endurance test it showed an economy of 10.4 mi. per gal., average.

The plane was constructed at the factory of the Wright Aeronautical Corporation in Paterson, N. J., according to designs of Giuseppe M. Bellanca, who first built a plane of this type in 1922. Even before his graduation from the Royal Institute of Milan in 1910, Mr. Bellanca had built and flown planes in Italy, so that he was an experienced designer when he first came to this country in 1911. The present plane is said to be one of the most efficient types in existence. It is known as a semi-cantilever type with diagonal struts that permit a full wing section instead of a tapering one. Due to their aerofoil section, the struts furnish lifting power greater than their own weight and also add lateral stability to the plane. The fuselage resembles a wing section and also furnishes some lifting power. The wing dimensions, 45-ft. span and 7-ft. chord, are slightly smaller than those of the Ryan monoplane flown by Captain Lindbergh.

The plane was powered by a Wright J-5C Whirlwind engine, a duplicate of the one used by Lindbergh in his Ryan monoplane. A rear view of the engine is shown on the facing page. Both motors were in a group of ten motors removed from regular production and given special inspection after the regulation test run of 5 hr. at full throttle. As described on page 929, Vol. 66, of the *American Machinist*, this engine is an air-cooled radial-type, has nine cylinders with a bore of 4½ in. and a piston stroke of 5½ in. It is rated at 200 hp. at 1,800 r.p.m., but the cruising speed, and the one at which it was operated in both transatlantic flights, was about 1,500 r.p.m., resulting in a plane speed of 100 m.p.h., with 115 hp. being developed. The propeller used to drive the Bellanca plane was mahogany, while Lindbergh's ship was driven by an all-metal one.

This motor was designed by S. D. Heron, an Englishman by birth, who spent six years in the U. S. Army Air Service before going to the Wright Aeronautical Corporation in 1926. The problem of getting rid of highly localized temperature particularly at the exhaust port had to be solved, but the selection of proper materials and the development of methods of machining them also contribute much to the present efficiency of the post-war air-cooled engine.

The Pioneer earth inductor compass and other navigating instruments were also the same as used in the previous transatlantic flight. The control board, illustrated on the facing page, was different, however, to the extent that it was intended for two pilots and had two compasses. Other instruments were the same.



***Above**—Rear view of the Wright J-5C Whirlwind engine, the type that carried both Lindbergh and Chamberlin to Europe*
***Below**—Pioneer instrument board of the Wright-Bellanca monoplane "Columbia"*

The Design of Small Springs

By J. S. Barker
Associate Mechanical Engineer

NEARLY all formulas for the design of helical springs are based on the idea of stressing the wire to a point approaching the elastic limit or, in other words, to use as little material as is necessary for the work to be done. This method results in economy and is satisfactory for large springs, but for small springs, especially in cases where the spring is to be held compressed for a long period, quite the reverse condition is desirable and the spring with the lowest possible stress is to be preferred.

In a great many cases springs must be designed for two certain loads at each of the two definite lengths. In the design of springs of this class the method given below has been developed and used by the writer with excellent results and considerable saving of time. Instead of starting out with some arbitrary value of allowable stress and working toward the size of wire (which never comes out to a standard size, anyway) we first develop the characteristic of the spring, determine immediately the standard size of wire that can be used to produce the lowest stress, and then solve for the number of coils required to give the desired characteristic.

By characteristic is meant the relation between change of length and change of load, and any spring at all, whether it be 0.01- or 1.00-in. wire may have any desired characteristic within its elastic limit provided only that it has the proper number of coils.

For any given set of conditions, the high limit on size of wire is fixed by the length available for the spring under its greatest load: The greater this length is, the larger the wire and the lower the stress may be. As a general rule the solid length of a spring should not be less than twice the length of its stroke, or change in length between the two required loads. By allowing from two and a half to three times the stroke for the length of the spring under its greatest load we can obtain a very good design.

In the table the values of load divided by deflection per coil are given covering a wide range of small springs. The values of the torsional modulus of elasticity G are for steel music wire. These values are lower than those given by some writers, but have been checked by use during several years and have been found to be quite accurate. For brass wire values one-half of those given in the table may be used, and for phosphor-bronze wire values 55 per cent of those in the table will be about right.

In the design of the spring the following steps are necessary:

1—Determine the characteristic:

$$C = \frac{P_2 - P_1}{L_1 - L_2} \text{ lb. per in.}$$

2—Determine the free length (theoretical):

$$L = \frac{P_2 (L_1 - L_2)}{P_2 - P_1} + L_2$$

3—Choose the wire and determine the number of coils.

The value of $\frac{P}{f}$ given in the table divided by the characteristic C gives the exact number of active coils required; the larger the wire, the greater the number of coils. It requires only a mental calculation to chose the solid length of spring to go into the space available.

4—Determine the pitch: $\text{Pitch} = \frac{N}{L - d}$ coils per in.

5—Determine the stress: $S = \frac{8PD}{\pi d^3}$

By this method of design, if the stress is too great to be permissible, then the proposed spring is impossible and a greater length at maximum load must be provided.

In order to make allowance for the greater deflection of the end coils, it is always necessary to add to the number of coils theoretically required, and if great accuracy is needed, the proper amount must be determined by experiment. The effect of the end coils is proportionately greater at the least loads but can be detected by test at all loads up to those that set the spring solid. The effect is inversely proportional to the total number of coils and hence, where great accuracy is required, the

Values of Load Divided by Deflection per Coil for Various Sizes of Wire and Coils

Values in body of table $= \frac{P}{f} = \frac{Gd^4}{8D^3}$

d	D = Mean Diameter of Helix, Inches																								$d^2 \times 10^6$	$d^4 \times 10^6$	G
	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17	.18	.19	.20	.21	.22	.23	.24	.25	.26	.28	.30	.32			
.006	15.6	9.03	5.68	3.81	2.67	1.95	1.46	1.13																		.216	.00130	
.007	28.8	16.7	10.5	7.03	4.93	3.60	2.70	2.08	1.64	1.31																.343	.00240	
.008	49.2	28.5	17.9	12.0	8.42	6.15	4.62	3.56	2.80	2.24	1.82	1.50														.512	.00410	
.009	78.7	45.6	28.6	19.2	13.5	9.84	7.39	5.70	4.48	3.58	2.91	2.40	2.01	1.69												.729	.00656	
.010	120.	69.4	43.6	29.3	20.5	15.0	11.3	8.68	6.82	5.46	4.44	3.66	3.05	2.57	2.19	1.87										1.000	.0100	
.011	176.	101.	63.8	42.7	30.0	21.9	16.4	12.7	9.96	7.96	6.48	5.34	4.46	3.75	3.20	2.74	2.37	2.05								1.331	.0146	
.012	249.	144.	90.5	60.7	42.5	31.1	23.3	18.0	14.1	11.3	9.18	7.57	6.32	5.32	4.54	3.88	3.35	2.91	2.55	2.25						1.728	.0207	
.013	344.	198.	125.	83.7	58.8	42.9	32.2	24.9	19.5	15.6	12.7	10.5	8.74	7.35	6.26	5.37	4.64	4.03	3.52	3.10	2.75	2.44				2.197	.0286	
.014		266.	168.	112.	78.9	57.6	43.3	33.4	26.2	20.9	17.0	14.1	11.7	9.87	8.41	7.20	6.22	5.41	4.73	4.15	3.69	3.27	2.65			2.744	.0384	
.016			286.	192.	134.	98.3	73.7	56.8	44.7	35.8	29.1	24.0	20.0	16.8	14.3	12.3	10.6	9.23	8.07	7.08	6.28	5.60	4.52	3.63	3.05	4.096	.0655	
.018				308.	216.	157.	118.	91.2	71.7	57.3	46.6	38.4	32.1	26.9	23.0	19.6	17.0	14.8	13.0	11.3	10.1	8.96	7.24	5.82	4.88	5.832	.1050	
.020					315.	230.	173.	134.	105.	83.7	68.1	56.1	46.9	39.4	33.6	28.7	24.9	21.6	18.9	16.6	14.7	13.0	10.5	8.51	7.13	8.000	.1600	
.022						336.	253.	195.	153.	123.	99.6	82.0	68.5	57.6	49.1	42.1	36.4	31.5	27.6	24.3	21.6	19.2	15.5	12.5	10.3	10.648	.2340	
.024							358.	276.	217.	174.	141.	116.	97.4	81.8	69.7	59.7	51.6	44.8	39.2	34.5	30.6	27.2	21.8	17.6	14.8	13.824	.3320	
.026								380.	299.	239.	195.	160.	134.	113.	95.9	82.1	71.0	61.7	54.0	47.3	42.1	37.3	30.2	24.3	20.4	17.576	.4570	
.029									462.	370.	301.	248.	207.	174.	148.	127.	110.	95.4	83.3	73.2	65.0	57.8	46.7	37.6	31.5	24.389	.7070	
.031										483.	393.	324.	271.	228.	194.	166.	143.	125.	109.	95.6	85.0	75.6	61.1	49.2	41.2	29.791	.9240	
	.125	.216	.343	.512	.729	1.00	1.33	1.73	2.20	2.74	3.37	4.10	4.91	5.83	6.86	8.00	9.26	10.6	12.2	13.8	15.6	17.6	22.0	27.0	32.8	$D^3 \times 10^3$		
	9.00	4.63	2.92	1.95	1.37	1.00	.751	.579	.455	.364	.296	.244	.204	.171	.146	.125	.108	.094	.082	.072	.064	.057	.046	.037	.031	Reciprocal $D^3 \times 10^3$		

G: 12,000,000 | 11,500,000

D = Mean diameter of helix, in.
d = Diameter of wire, in.
P = Load, lb.
P_1 = Load at greater length, lb.
P_2 = Load at lesser length, lb.
L = Free length, in.
L_1 = Length at P_1, in.
L_2 = Length at P_2, in.
N = Number of active coils

F = Total deflection, in.
f = Deflection per coil $= \frac{F}{N}$
G = Torsional modulus of elasticity. Values in table are for first-grade music wire.
S = Stress, lb. per sq.in.
C = Characteristic of spring
$\pi = 3.1416$

$f = \frac{8PD^3}{Gd^4}$ $\quad S = \frac{8PD}{\pi d^3}$ $\quad S = \frac{fGd}{\pi D^2}$

$L = \frac{P_2(L_1 - L_2)}{P_2 - P_1} + L_2$ $\quad C = \frac{P_2 - P_1}{L_1 - L_2}$ $\quad N = \frac{P}{fC} = \frac{Gd^4}{8D^3C}$

$\text{Pitch} = \frac{N}{L - d}$ Coils per inch

longer the spring is, the better. For springs with plain ends (not squared or ground) it has been found that the addition of $\frac{5}{N}$ coils to the theoretically ideal spring is as near right as can be stated by formula.

The following is an example of spring design that, under test, varied less than 2 per cent from the required values:

Required a spring to carry a load of 0.096 *lb. at length of* 0.145 *in. and a load of* 0.114 *lb. at a length of* 0.093 *in. with an outside diameter of* 0.150 ± 0.005 *in.*

1—$C = \frac{0.114 - 0.096}{0.145 - 0.093} = \frac{0.018}{0.052} = 0.3461$ lb. per in.

2—L (free) $= \frac{0.114 \times 0.052}{0.018} + 0.093$

$= 0.422$ in. (theoretical)

3—Choose wire. From the table, under 0.14 in. mean diameter and 0.009 in. wire, $\frac{P}{f} = 3.58$ and $\frac{3.58}{0.3461} = 10$ coils, call 11, including inactive. The solid length is about 0.108 in., which is too great. Try 0.008-in. wire. With 0.008-in. wire, $\frac{P}{f} = 2.24$ and $N = \frac{2.24}{0.3461} = 6.47$ coils.

4—Pitch $= \frac{6.47}{0.422 - 0.008} = 15.6$ coils per in.

5—Stress at max. load $= \frac{8 \times 0.114 \times 0.14}{3.1416 \times 0.512 \times 10^{-6}}$

$= \frac{0.12768}{1.6085} \times 10^6$

$S = 0.0793 \times 10^6 = 79{,}300$ lb. per sq.in., a permissible stress.

6—Add $\frac{6.47}{5} = 0.79$ coil, making 7.26 coils in all.

SPECIFICATIONS

Wire.....0.008 in. music
O.D.....0.148 ± 0.003 in.
Pitch.....wind 15 per in.
No. of coils.....$7\frac{1}{4} \pm \frac{1}{8}$
Ends .....plain
Set by compression until no further shortening is apparent.

The Inch—Discussion

BY E. S. MUMMERT

IN REFERENCE to an article by Sir Henry Fowler, under the title given above and published on page 723, Vol. 66, of the *American Machinist*, I also have made a study of several works by engineers who have investigated the great pyramid of Cheops, and it is interesting to note that the unit of measurement there used was just 1.001 of our standard inch.

It seems that the great designer and architect wished not only to record our standard inch, but also the small decimal part that we now use so much, the thousandth part of an inch. I think our precious little inch and its tiny offspring are too well established to be legislated out of existence. The inch is an exact relative quantity whereas the meter is not exactly relative to anything, due to the errors made in the original calculations, and has become merely an arbitrary unit.

A Foundry in a Patio

FOLLOWING the Spanish style of architecture, the houses in Havana, Cuba, have patios, or open courtyards, behind the front rooms. Nearly all the rooms have tiled flooring and wainscotings of tile, which are both cool and attractive. As industry creeps into what was once the residence section, these tiled rooms become

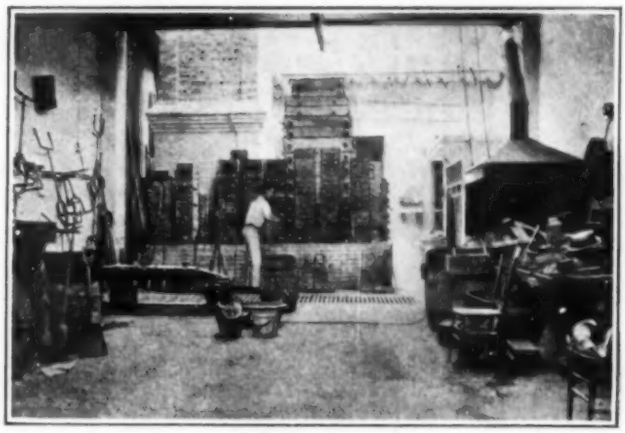


Fig. 1—The furnaces, flasks and core oven

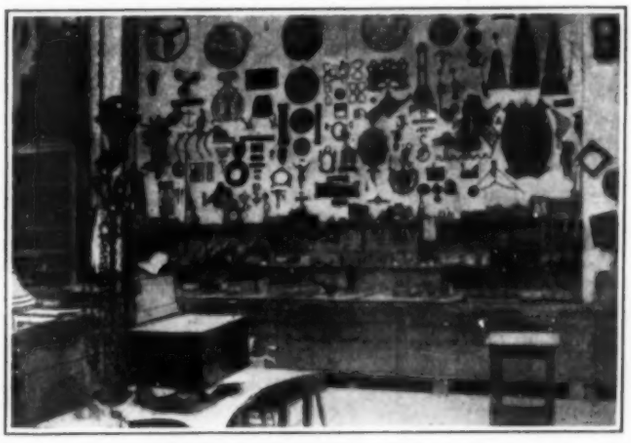


Fig. 2—Molders' benches, sand bins and samples of work done

small shops or garages, and it is not uncommon to find a collection of small machine tools in a room that was once given over to society functions, and having attractively decorated tiles both on the floor and side walls. It is a bit unusual, however, to find one of these buildings converted into a foundry, as illustrated herewith.

As will be seen in Fig. 1, the partition at the back of the front room has been removed so as to afford free access to what was formerly the patio. A substantial chimney has been built, and the necessary excavations made for the brass furnaces and the crucibles. At the right is a small core oven, and, as can be seen from the goodly number of flasks piled over the furnaces, a large variety of castings is produced in this little foundry, which apparently specialized in small fancy brass castings and also in church bells and chimes. A part of one bell is shown in Fig. 2 at the extreme left.

This illustration also gives a good idea of the great variety of castings made. The photographs were secured through the courtesy of the proprietors, Lopez y Llaurodo.

THE · FOREMAN'S · ROUND · TABLE

Consulting the Foreman on Tool Design

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"GOT kind of puffed up this morning, Al," said Ed as they lined up at the lunch counter.

"What about, Ed? Someone say you were good-looking?"

"Nothing like that, Al. But the new tool designer came down with some sketches of new fixtures he's doping out for those gear housings. Wanted me to look them over with him and see if they were O.K. for the machines in my department. Said Williams had asked him to see me before he went too far with the designs, to see if I could suggest any improvements. Made me feel as though I was 'some punkins' after all, Al."

"Williams is a real guy, Ed. He's doing some of this practical psychology in great shape, Ed, and it's good stuff, too."

"Just what do you mean, Al? Ain't knocking me behind my back with big words, are you?"

"Not a bit, Ed. It's a good plan, and a lot of shops do it. When those fixtures are done you've just got to make 'em work. So it's the best plan in the world to have you look 'em over and do any fault finding now.

"You can help the designer a lot, too, Ed, because you've had a lot more experience using fixtures than he has. You know just what machines they'll go on—and some machines have little quirks of their own that are not in the builders' catalogs."

"Guess you're right, Al. I did point out a few things to him. And after I was all through, he asked me to put my name on the sketches."

"That the dope, Ed. Williams wants you to do your kicking now, before they're made. Then, when you've had your say, you sign the sketches as being O.K. So when the jigs come into the shop, it's up to you to make 'em work. You haven't got an alibi left, Ed."

"But don't you think it's a good plan, Al?"

"You bet I do, Ed. It's good all around. It gives us a chance to use what brains we have when it will do the most good. It puts it up to us to make the jigs go after we've signed the sketches. I'd do just one thing more if I was Williams. I'd make the man who's going to use 'em sign it, too."

Is Williams' plan a good one in most shops?
Was Al right as to its advantages?
Should the worker also approve the sketches?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Is the Company Picnic a Good Thing?

WEBSTER says that a picnic is "an outdoor pleasure party provided with its own eatables and other means of entertainment." The purpose of a company picnic is to stimulate a better fellowship amongst the men in the factory, and to acquaint the families with one another. The site for a company picnic should be carefully chosen, and it will be found that the wiser choice will favor some secluded wooded glen or pasture just outside of the city in preference to the public amusement park where the merry-go-round, the shooting gallery, and the general public will tend to distract the attention of the picnic crowd. In the case of the larger factories, it would be to advantage to divide the picnic into different departments or shops and have each group picnic at a different place in order to have smaller groups. The management should decide whether or not it would be advisable to have a company picnic, but it is only fair to give the men a chance to express their sentiments, for after all they are the ones who are having the picnic. It is advisable in planning a picnic to arrange the amusements and especially the "eats" so that there will not have to be a great deal of "luggin'" done by the families. If the general opinion is that the men will be too tired to work the following day, why not plan for a Saturday and have Sunday to rest up? Sacrificing the plans of a few family picnics over the week-end will help to make the company picnic a greater success. Human nature demands fellowship, and the company picnic will answer this requirement for the shop.

—WILLIS KUSCHMANN.

IF the employees live in the city so that going to the country is a change to both workmen and families, by all means go. A picnic means a lot of work to the women folks, and they get no pleasure out of putting up lunches and caring for children out in the woods, if that is where they spend their lives, anyway. The country shops might spend a holday in the city, though I never heard of it being done intentionally. One shop out in the country arranged an excursion to the seashore. The participants had to go through a large city to get there, and most of them never got past the city.

A picnic is a severe test of the management. Most officials feel that it is a duty for them to appear on the grounds, but if they come, look bored, and slip away to some place where they can get a meal that none of their employees could afford, it counteracts all the good that their presence might give. If he is willing to leave wife and friends at home and take pot luck with the crowd the big boss can make himself solid with his crew. It's worth the sacrifice, and may not be so disagreeable. There are two excuses for picnics; one, to get away from the shop, the other, to get acquainted. So, of all things, don't picnic unless the management will go and take part like the rest of the crowd.

—ENTROPY.

I HAE ma doots aboot this company picnic idea. It leads tae naething but expense; spend, spend, frae beginning tae end!

It's no onla the price o' the ticket, it's what travellin' salesmen ca' eencidentals that mount up. There's the wife noo, she'll be needin' a new dress an a bunnet, an' the shorter the dress the longer the price. An both the lassies and the laddies will be needin' 'Plus fours' an', what's mair, they'll a' be sure tae be pesterin' me tae get a braw new suit tae masel'. Hobnobbin' wi' the big bosses an' their weemin fowk's an' expensive luxury.

Then, seein' I'm a foreman, I'm suir tae be expected tae put ma haund in ma pocket for a subscription tae the prize fund for the sports. I've seen the day when I caud hae won it a' back again, an' mair, but twenty-odd years o' upholdin' the deegnity o' a foreman's poseetion has stiffen'd ma joints maist aufu'.

Anither turrible aggravatin' thing at a picnic is tae hae tae listen tae the travellin' salesmen, an' ootside erectors, yae an' the big boss himsel', tellin' their tales. Whaur the' get them a' has fair got me beat.

Aye, an' shop efficiency is like tae suffer a verra great setback. For weeks afore an' weeks after the haunds are sure tae hae their heads tagether, veesithin' an' crackin' aboot what they'll dae an' what they did, an' ma output bonus is sure tae be verra much dimeenished. Na na, Maister Editor, the company picnic's no the thing. Of course there's the possibeelity that the firm micht be persuaded tae stand a' the expense, in which circumstance I micht be induced tae cheenge ma mind.

—S. C. MILLER.

THE company picnic is a good thing because it brings out the human qualities of the executives, causes individuals to establish intimate contacts with each other that they could not do otherwise, and introduces the families to the company. Particularly, it establishes friendly relationships between men who do business with each other, and yet never meet except through pieces of paper. We all have a friendlier feeling toward those we know, and the company picnic serves as the introducing medium.

THE · NEXT · TOPIC

Looking Beyond the Department

QUESTIONS

Assuming that the first job of a foreman is to get out the production of parts at minimum cost, should he go further and interest himself in the finished product, or affairs outside his own department?

In general, the closer the desire for a picnic arises from the ranks, the more assured its success is. In the absence of a social organization in the plant a popular vote would be logical, with the management clearly defining its willingness to co-operate on the picnic if the men want it. —JOHN W. KANE.

I BELIEVE company picnics present a wonderful opportunity for the employer to show his interest in the recreational welfare of his employees and their families, and that they are beneficial to both. It is one of the best tonics that can be prescribed for the welfare ills of any organization, religious, social or industrial. The one big kick I get out of a company picnic is to meet Bill Smith, whom I have seen in the shop, greasy, and dirty, sweating, and fussing, for the past twelve months, come out to the picnic with mother and the kids, all dressed up in their Sunday best. When that happens, I sure do respect Bill as a better workman and fellow shop-mate. —BEN T. HUMMER, *Gen. Foreman.*

THERE is no gainsaying that the shop outing, rightly managed, is an asset to both employee and employer. For one thing, an outing brings about better understanding among all those participating. The superintendent, the foreman, and others of the machine shop, can learn more about the employees from their families. The families, on the other hand, see at the outing that all is not so commercial with the boss; that he has their welfare in mind. Thus is promoted untold good will.

At work the employee is one kind of character. He is another individual at the annual "clam-bake," where he throws light on some of his finer qualities. The machine shop executives see him, perhaps for the first time, in his true light. He stands out as a different man. Can it be said that these executives are losing?

—FRANK V. FAULHABER.

Getting Information from Salesmen

THE wealth of information that can be obtained from salesmen is a revelation to anyone who is fortunate enough to come in contact with them. My only regret is that I do not see enough of them, and I feel sure that the majority of foremen will agree that they do not come in contact with them as much as they would like. I can say that whenever I have had an opportunity of discussing shop with a salesman I have always learned something.

I sincerely hope that this discussion will catch the eye of the superintendent and the purchasing agent, and that they will let any salesman that they interview have a few minutes with the shop foremen. The results will be a surprise to them.

—C. L. HENRY, *Foreman, England.*

FOREMEN can gain considerably by welcoming salesmen from the different houses. The foreman should never be influenced because of personal likes and dislikes; with him it should be a question whether he cannot procure some new valuable ideas.

Salesmen, it must not be overlooked, cover much territory; theirs is a wide range of observation, a privilege which comes rarely to the shop foreman. During their discussions in the various shops there come up the problems that are the knottiest; there is a swapping of ideas and experiences as to how different plants and different foremen are meeting and solving similar problems. And the salesman is just the individual who can transmit his knowledge, and he will do so readily, particularly when he is accorded a receptive hand in the shop.

Wouldn't it be a good idea now, for instance, the next time a salesman comes, to invite him to go with you and meet employees to discuss and witness various processes? Ask the salesman to give you suggestions. He will have some brass-tack ideas, be assured.

—FRANK V. FAULHABER.

I HAVE known chiefs who object to the staff holding forth with travelers for more than a few minutes. The policy is short sighted. Although all the time spent may not be confined to business, a certain amount of it must be, as otherwise the salesmen would have a "thin" time. It is one of the chief functions of a salesman to know all that is happening in the trade. If Messrs. So-and-So install fast automatics, he will soon be around trying to sell them some high-speed steel taps to suit.

When a salesman calls to see me, I mention to him any problems in which I am interested at the moment. He will probably have suggestions to make with regard to some of them, and including some of his products. He tells me his troubles, and I also make suggestions. It's a fifty-fifty business, but I think the firm gains through our periodic conversations.

A. L. WALKER, *England.*

A GOOD salesman is always a welcome visitor in my shop. But it is surprising and very disappointing when you speak to some young salesmen to find out how little they know about the product they are trying to sell. I have a number of young men call with tool steel, and in most cases all they can say is that theirs is the best, but if questioned about its manufacture or its heat-treatment, and the work it will do, they can only suggest sending a sample trial lot which after a while is charged up in the usual way. Such cases makes one feel shy at even accepting a trial sample. Some salesmen can give much information about many things and methods, and safeguards as well, but as a rule there are only a few of such men upon the road.

—H. MAPLETHORPE, *England.*

DURING a long experience I have relied, to a great extent, upon advertising literature for my information, backed up by reading all I can of what others are doing, and a visit by a salesman able to add to this has always been most welcome. Being practical, these men give credit where it is due, while those of the opposite type are easily recognized by the fact that they do not favor anything but what they are paid to sell at that particular moment.

There is no doubt that Timmins, besides his practical knowledge, also possesses an attractive personality and the ability to say the right thing at the right time. Walking through a machine shop he notes what is not as it might be, and although it is of no direct financial

benefit to himself or his firm, he gladly gives advice when asked. Reliance is placed upon his word, with the result that he is not passed by when his tools are likely to be of service. —F. P. TERRY, *Ireland.*

How Do Mutual Aid Societies Help?

WE HAVE a successful employees' benefit association that provides three classes of policies as follows: 1. Initiation fee of 45c., and dues of 30c. per month for benefits of $6.00 per week. 2. Initiation fee of 35c. and dues of 20c. per month for benefits of $4.00 per week. 3. Initiation fee of 25c. and dues of 10c. per month for benefits of $2.00 per week. The timekeeper deducts the amount of dues from the pay of each member on the last pay day in each month. No benefits are paid for sickness of less than one week; then they are paid for 13 weeks. The death benefits are $50.00 for anyone who has been a member for five years, and an additional $10.00 for each additional year of membership. —DAVID T. FLETCHER.

MUTUAL aid societies are most valuable in helping a man, and should, I think, be voluntary. A company I know runs a voluntary scheme. Each man, if he agrees, pays a small sum each week, and this amount the company deducts from his wages. The company keeps accounts and acts as banker, allowing interest on the balance, but a committee appointed by the men defines the rules and administers all benefits. There is also a death benefit covering the man and his wife, and the balance is carried forward each year. While the benefits are not very large, they are a Godsend to most men in times of need.

—T. WELSH, *England.*

Arguing with the Big Boss

IF A FOREMAN thinks another method is better than the one he is instructed to use, he should try to talk it over with the boss and see if they can come to an agreement on the better way. If his method is better, and he puts it up to the boss in such a way that he can show where there is a saving, he won't have a hard job convincing him. However, if it is agreed to do it the boss's way, the foreman should do so and back the boss up just as strongly as he would if they were using his own method. A foreman should plan his work to be done as quickly and cheaply as possible with the equipment on hand, and should never use a machine just because someone bought something the shop didn't need.

—THOMAS M. GARRY, *Foreman.*

Do We Buy Labor or Production?

WHEN a new machine tool is bought we compare it with similar machines of other makes in terms of production per dollar. The capital value of a machine is usually a fair representation of its production capacity, and buyers do not hesitate to pay the extra dollars which a good machine will cost if it can be proved that it is going to pay by increasing production.

Is it not natural that the capital value of labor must vary in a similar manner to that of machine tools? As a purely business proposition, therefore, it would be quite as sound a policy to pay for labor according to production as it is to buy machine tools on like terms.

Pursuing this same line of reasoning, when the new machine comes into the shop no effort is spared to insure that it has every opportunity of proving itself a sound investment by giving it the most suitable work to do, by supplying it with the most efficient equipment, by having the best possible system of lighting, and so on. No effort should, therefore, be spared to insure that labor, too, has every chance to prove itself a sound investment. —JAMES C. HARPER, *England.*

Paying the All-Around Man

IT IS worth more than is apparent at first hand to keep machines running. A tied-up machine ties up the operator, and affects production all along the line, and means that special efforts must be exerted if production schedules are to be met. All this special effort costs a great deal in indirect expense. Therefore, anything, or anybody, that can reduce such delays to the minimum, is worth money to an organization.

As the value of the all-around man is hard to measure in terms of direct production, it often happens that he does not get enough as compared with the piece worker, whose value is easily measured directly. The all-around man is like the engineering department; he is necessary and indispensible, but is too often looked upon as so much overhead. Yet, he is a considerable factor in keeping down indirect costs. —GORDON THRONE.

ALMOST every shop considers the all-around man a non-producer, a man who must be there, but who is not a production asset. And often, when the boss is think of cutting expenses, the wages paid to the all-around man bother him. But every man who understands the work in the plant and has thought some about the expenses must learn that expenses never can be cut without the maintenance man.

If it is the task of the all-around man to keep the machines running, he should be paid for the running of the machines; that means for the production. Give the all-around man a bonus on the production of the department, and you will find what a difference it makes to have or not to have a real all-around man.

—EDWARD PROSTEL.

Hiring Back the Fired Workman

ANY successful foreman has three distinct forces to balance in the performance of his duties: He must first of all labor to make his employer's business a success; in all of his activities he must retain the confidence of his subordinates; and he must keep at all times his self respect.

Ordinarily an executive takes a long chance when he re-employs a man of Grogan's type. If, however, Al was in a position to observe Grogan after he had fired him and was sure that the transformation was complete, I believe he was justified in hiring him back. In fact, if he was positive that the new Grogan would make a superior employee, he was breaking faith with his employer if he did not rehire him. He was even justified in displeasing his subordinates, if need be, for the benefit that would follow.

There is no definite rule which says that a discharged workman may or may not be rehired. The circumstances of any particular case must be carefully investigated and a fair decision made. —L. N. GULICK.

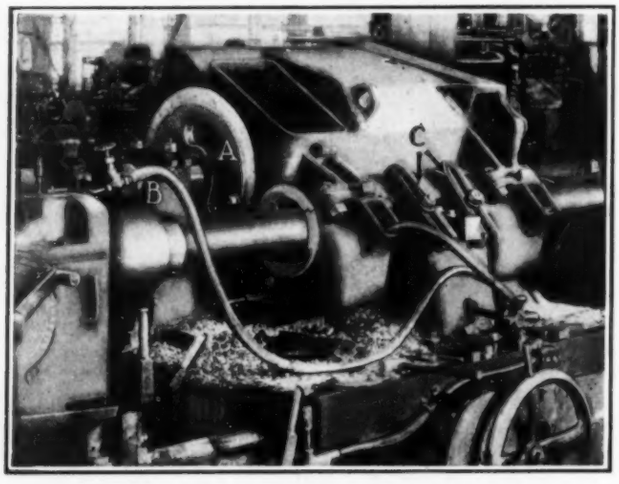
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Boring Motor Frames on Engine Lathes

By Henry C. Francis

The engine lathe is still far from obsolete, in spite of the highly specialized "automatics" and "semi's" that have so greatly reduced the machining costs in large production shops. The illustration shows how a fairly large shop bores bearings in railway motor-frames, not



Boring a motor frame on an engine lathe

on a wreck of a lathe, but on one of the geared-head variety equipped with push-button control.

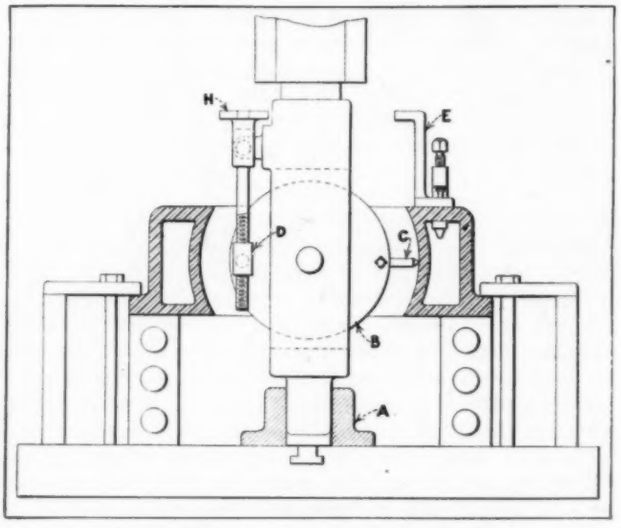
After boring the large hole for the armature support on this same lathe, the frame is swung on the large mandrel *A*, supported at the ends in pedestals as at *B*. The location of the mandrel positions the frame for the second hole, insuring the correct center distance between the two holes. The front of the frame is clamped on a suitable support by the hairpin straps at *C*. The frame is fed along the boring bar, and the hose shown delivers an ample supply of coolant.

Spherical Work in a Boring Mill

By H. Lameck

Having recently had occasion to machine some large ball-seat castings, we made the set-up on the boring mill as shown in the drawing.

The end of the boring bar, for rigidity, rests in the bearing *A*, accurately centered in the boring-mill table. A disk *B* of known diameter, that is small enough to enter the ball seat and still leave room for the toolbit *C*, is firmly pivoted to the side of the boring bar. The cutter is held at one edge of the disk, while directly



Set-up for boring a spherical seat

opposite, the swivel nut *D* engages the feed screw. The feed screw is pivoted at its upper end to a swivel block attached to the boring bar.

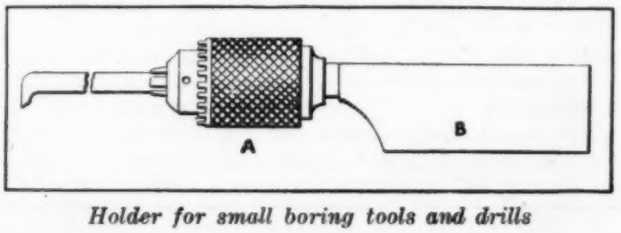
The work is set up so that the center line of the ball seat and the pivot of the disk are in the same horizontal line. The "kicker" *E* may be fastened to the work as shown or to the revolving table. Each time the table makes a revolution the "kicker" turns the star wheel *H* part of a revolution causing the screw to rotate the disk and thereby feed the tool in a circular path.

Measuring the size of the ball seat by taking trial cuts is unnecessary since a gage can be made for setting the toolbit to cut the size required, the outside diameter of the disk being known, the gage should be made so as to measure from the periphery of the disk to the point of the cutter.

Holder for a Boring Tool

By Charles Kugler

The toolholder illustrated is the best that I have seen for small work. The chuck *A* has a capacity of $\frac{1}{4}$ in. The shank *B*, which is held in the toolpost, is made from



Holder for small boring tools and drills

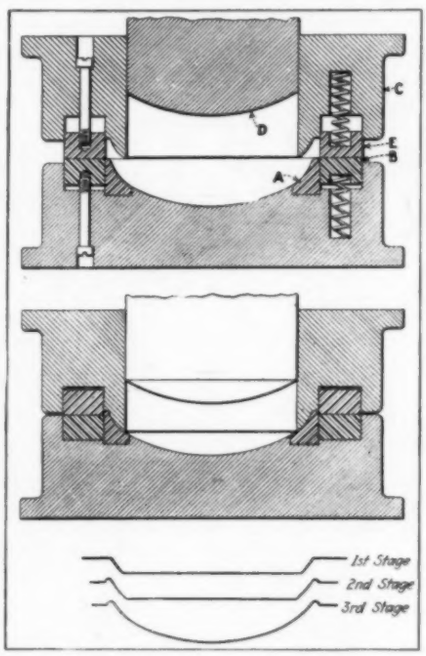
a piece of cold-rolled steel 1x⅝ in., 4 in. long, turned to a taper at one end to fit the chuck.

This device may also be used for holding drills. In fact, work can be both drilled and bored in the lathe with it.

Forming Die of Unusual Construction

By Charles M. Otis

A forming die of rather unusual construction which I designed and built for forming the top piece or breast of a 5-gal. oil can is shown in the drawing. It is a triple-action die used in a double-action press. The problem presented was to draw a top without a lot of wrinkles around the side. It is difficult enough to draw a plain disk shape without wrinkles, but this piece is doubly hard to handle on account of the ¼-in. bead around the edge, over which the stock will not draw. The die has two inserted steel rings *A* and *B*. Ring *A* is fixed in position, but ring *B* is free to move up and down an amount equal to the radius of the bead. A number of stiff springs hold this ring up, so that its upper face is in line with the top of ring *A*. This arrangement permits the stock to be drawn over ring *A* in a straight line during the early part of the stroke of the upper pressure ring *C*, which acts before the punch *D* contracts with the work. The pressure member *C* carries a sliding steel ring *E* actuated by springs, but these springs are not as stiff as the ones in the die. When the punch descends, ring *E* is gradually pushed up, the lower ring *B* remaining flush with the top of *A* until ring *E* bottoms. Then ring *B* is gradually pushed down, forming the stock over the bead on *A*. A large part of the draw has been completed before this occurs, and when the ram reaches the bottom of its stroke, we have a smooth blank held snugly around its entire upper part, and free from wrinkles. The last part of the operation is really more of a stretch than it is of a draw although there is a slight drawing action.



Triple action drawing die

The amount of work to be performed in the first step is a matter of judgment and experiment. If, however, these two parts of the operation are nicely adjusted, a very smooth piece will be secured. The ring or mark caused by the inner edge of the upper pressure ring is hardly noticeable. This die not only produces a cover in one operation, but one that is entirely free from wrinkles.

Tools for Piercing Bayonet Slots

By Atol Maker

The sketches illustrate a set of press tools for piercing bayonet slots in radio-tube sockets. The sockets, as shown in Fig. 1, are brass ferrules attached to Bakelite bases by inserting them in the mold and molding the Bakelite around them. Four contact clips as at *A* are held in place by round-head screws, used as binding posts.

The die *A*, Fig. 2, is a snug slip fit over the stud *B*. After the two have been assembled, the stud is held in the upright member *C*, the die being firmly seated in the recess *D*. The stud is doweled in the upright to prevent it from turning. The cast-iron bolster is cut

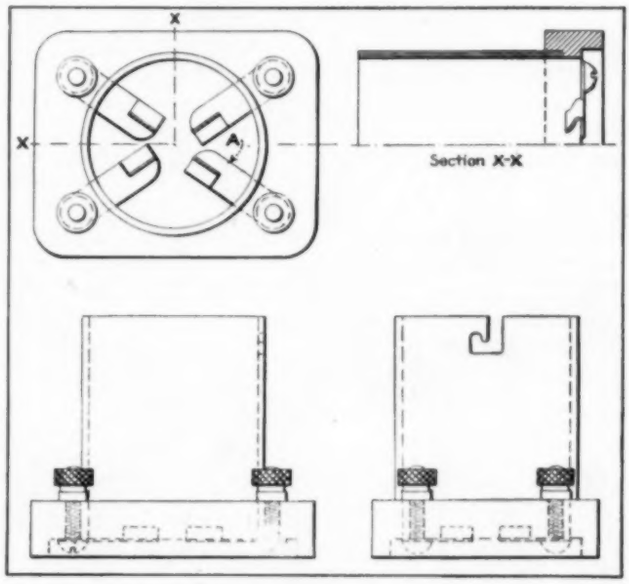


Fig. 1—The completed socket

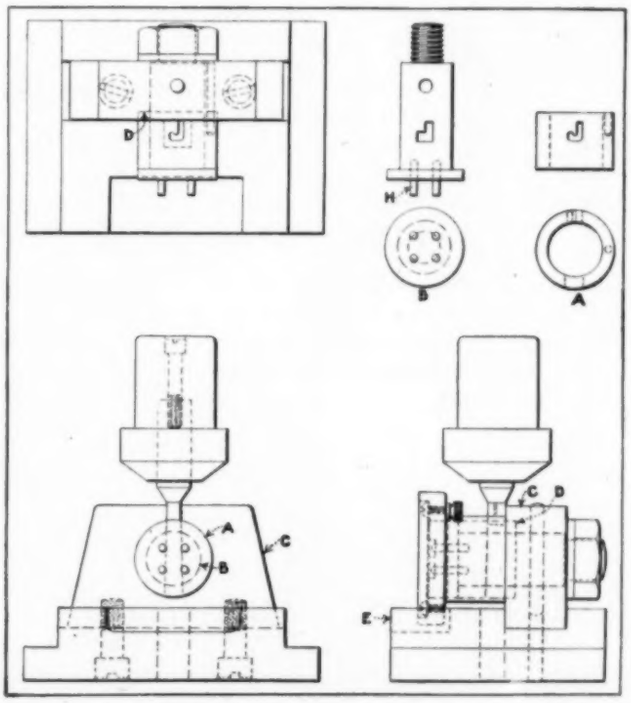


Fig. 2—Press tools for piercing the bayonet slot

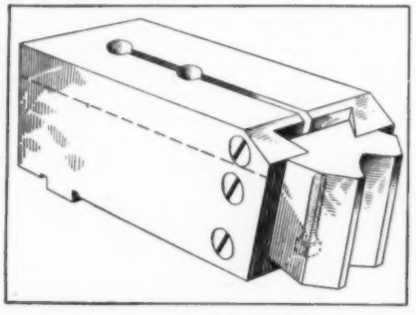
away at *E* to clear the Bakelite base when the socket is placed over the die.

When a tube is placed in the socket, its prongs make contact against the spring clips at *A*, Fig. 1. When the tube is turned in a clockwise direction, in order to lock it, the prongs are forced against the bent-up parts of the spring clips. If the bayonet slot has not been pierced in the correct position in relation to the bent parts of the spring clips, the tube will not make a good contact in the socket. Since the bases were made in half a dozen different molds, all varying somewhat, it was decided to locate the bayonet slots directly from the bent parts of the spring clips. To this end, four locating pins *H*, Fig. 2, were put into the end of the stud *B*, so that when a socket was placed over the die and turned in a clockwise direction, the bent parts of the spring clips would contact with locating pins. No stripper was necessary, because the socket could not be lifted from the die by the action of the press.

Getting More Service from Form Tools

By H. L. Wheeler

The kind of form-tool holder often used in connection with four-spindle automatic machines is open to the objection of compelling a considerable waste of valuable material and labor by reason of its incapacity to hold the tool after it has reached a certain minimum length by regrinding. The holder shown in the sketch was made with the idea of getting more out of the tools. The result is accomplished by increasing the height of the holder about 1 in. and adding a third binding screw. The two lower screws are in the same relative position as the corresponding screws of the original holder. The bevel on the front end of the holder just back of the tool is to eliminate a pocket for chips.

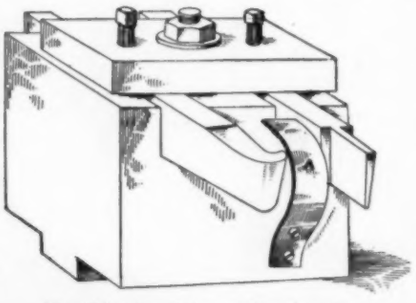


An improved toolholder

A Work Ejector

By Charles Horne

We were making a lot of large brass nuts on one of our automatic screw machines, and had considerable difficulty because when the nuts were cut off from the bar, occasionally one of them would become wedged between the facing and parting tools. If the operator was not on the spot to clear any nuts that were so wedged, there would be a smash-up while the next nut was being cut off. To remedy the difficulty, I put a stiff, flat spring on the front of the toolblock between the tools, as shown at *A* in the sketch. As the tools fed into the work, the spring was compressed. After the nuts had been cut off, the spring exerted sufficient force to positively eject them from between the tools as they receded.

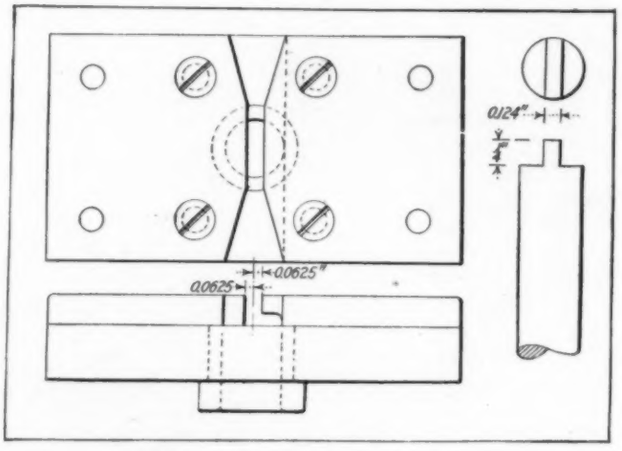


Toolblock with spring in place

Inspection Gage for a Tongue

By Frank Waldo

The illustration shows a gage for checking the size and position of a tongue milled on the end of a shaft. The body of the gage has a bushing in the under side, and two gage blocks at the top, as shown. The bore of the bushing is of the correct diameter of the shaft. The space between the gage blocks is the same as the thickness of the tongue to be milled. If the shaft is oversize, it will not enter the bushing. If the tongue is out of center, or if it is oversize and in the center, it will not pass between the gage blocks. To enter between the gage blocks and fill the opening, the tongue must be of the right size and in the center of the shaft. An undersized tongue central with the shaft, can be detected by any play that exists when the shaft is partly rotated. One of the gage blocks is cut out on the under side to permit visual inspection as the tongue enters. At the right is shown the work to be inspected.



Gage for checking a tongue

Straightening Shell-Reamer Arbors

By Richard H. Kiddle

Due to rough usage and accidents, many of our shell-reamer arbors become bent at the inner ends of the tapered seats for the reamers.

To straighten an arbor, we heat it at the bend and run it in a lathe, between centers. Then with a tool held in the toolpost, back-end-to, we bring the butt of the tool against the arbor at the point of greatest bend, and feed the tool in gradually. Thus, the bend grows less at each revolution, until finally the butt of the tool bears at all places of the zone being straightened. When this takes place, the arbor is straight, but we let it continue to run until it is almost cold, without altering the position of the tool. When cold, the arbor will stay straight.

To prevent the butt of the tool from scoring the arbor, it should be ground slightly rounding, then polished.

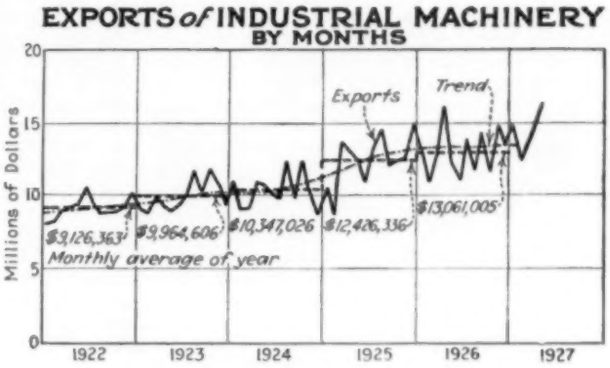
Activity in the Metal Working Industries

Productive Activities at Slightly Lower Level

That the metal working industry of the country is operating considerably below the operations of last year is indicated by reports of monthly electrical energy consumption by the manufacturing plants as tabulated by the *Electrical World*. Reports for May indicate that the actual production in the industry as a whole was 2 per cent below that of April of this year, and 5 per cent below May of last year. The productive activity during May is found to be 1.5 per cent below that of April after corrections are made for the number of working days in the two months.

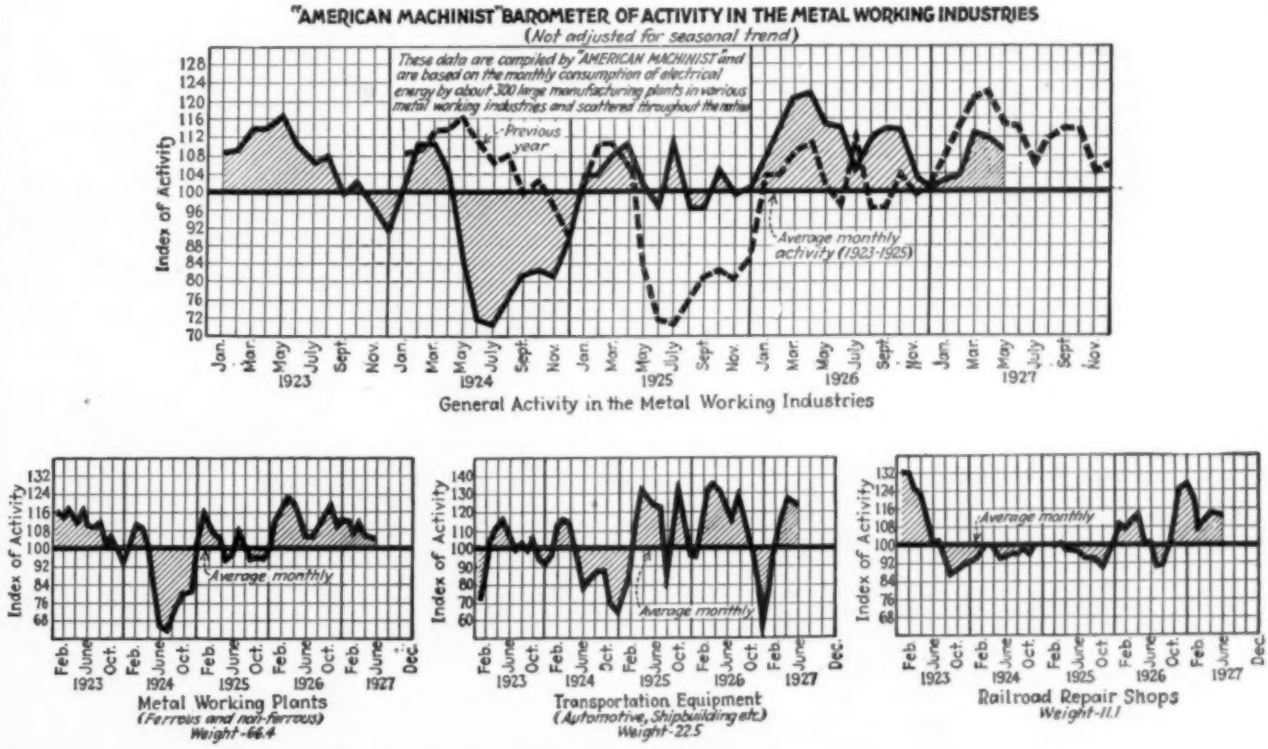
This is the second consecutive month during which the activities of the metal working industry have been below those of the preceding month, but past experience shows that this decrease is to be expected at this season of the year. The general trend follows quite closely that of the previous year, but on a lower plane.

General production in the industrial plants of the country during May appears to have declined slightly from that of April, but was still about 7 per cent above that of May of last year. The production of the manufacturing plants is apparently holding up much better this year than during the same period of last year. The indications at the present are that general production during the summer months will hold up to that of last year, if not exceed it.



The operations of the metal working industry during the first five months of the year indicate that 1927 will be in all probability another good year, and that the production of these plants will not fall more than 5 per cent below that of last year.

Exports of industrial machinery in April were the largest for any month during the past five years, according to Department of Commerce figures. Exports in April amounted to $17,339,000, or a gain of $1,461,000 over the shipments of April, 1926, the previous high point. The large gains were in construction and mining machinery, and textile machinery.


"AMERICAN MACHINIST" BAROMETER OF ACTIVITY IN THE METAL WORKING INDUSTRIES
(Not adjusted for seasonal trend)
These data are compiled by "AMERICAN MACHINIST" and are based on the monthly consumption of electrical energy by about 300 large manufacturing plants in various metal working industries and scattered throughout the nation
Previous year
Average monthly activity (1923-1925)
Index of Activity
1923
1924
1925
1926
1927
General Activity in the Metal Working Industries
Metal Working Plants
(Ferrous and non-ferrous)
Weight-66.4
Transportation Equipment
(Automotive, Shipbuilding etc.)
Weight-22.5
Railroad Repair Shops
Weight-11.1
Average monthly

© American Machinist

Technical Abstracts

Electric Locomotives with Auxiliary Batteries

The Chicago, North Shore & Milwaukee is obtaining two 65-ton electric locomotives which can be operated either from a trolley or from the storage batteries on the locomotives. While operating from the trolley, the batteries can be charged through a motor-generator set. The flexibility of operation of the locomotives, the first of their type, will enable them to switch cars into industrial plants equipped with tracks but not with trolley connections. The absence of smoke, noise and noxious gases will permit the locomotives to run into bulidings where steam locomotives would be objectionable.

The equipment of each locomotive includes four 200-hp. motors and a storage battery of 192 cells, capable of delivering 260 kw.-hr. on one charge. Operating on the battery, the locomotive can haul 33 loaded freight cars 5¼ miles at 12 m.p.h. on one charge, or run light at a maximum speed of 37 m.p.h. The locomotives are being built by the General Electric Company, and will be equipped with storage batteries furnished by the Electric Storage Battery Company.—*Railway Age*, May 28.

When Will Germany be Ready to Compete?

The psychological attitude of the German people toward the rest of the world is devoid of animosity, envy or fear. They admire the advanced industrial and commercial technique of the United States and expect to excel along these lines. Also they look to the United States as the principal source of capital, cash and credit.

Business today in Germany is like that of a company going through the reorganization following a receivership. Germany lost 2,000,000 men in the war, 60 per cent between the ages of 19 and 29. Forced cessions of territory totaled 27,000 sq.mi. 25 per cent of her potash deposits, 26 per cent of her coal, 30 per cent of her blast furnace capacity and 75 per cent of her iron ore reserves were lost as well as her colonies and most of her merchant marine. Her banks were paralyzed and her insurance companies ruined. The German stock market has trended upward in what looks like a boom, but the underlying cause was idle American capital in Germany which had been secured to finance expansions that were curtailed because of lack of markets. Great things were expected from the international cartels and from the markets of Soviet Russia but they failed to materialize.

The chemicals, dye products, steel, potash, textile, cellulose products and brewery interests are flourishing, but there are 1,438,000 unemployed, most of them coming from the machinery manufacturing, electric goods manufacturing, automobile, motion picture and retail businesses. These industries are down because of the impoverishment of the masses during the inflation period, the increase in living costs that followed the revaluation of the mark, and the national policy of low wages.

Germany is today competing for world trade, her share being 8.5 per cent, as compared with 13.1 per cent in 1913. She has lost in Russia, England, France and the United States, but gained in the Far East. Cartels exist in every industry, their net effect being to raise domestic prices as high as the traffic will bear to offset the losses incurred in capturing foreign business. They have all the bad features of the trusts against which Roosevelt fought. A determined movement is on foot to shake the complacent spirit with which the German manufacturers and merchants view moderately good business. The average German business is more efficient than the average American business, but Germany has few, if any, of the highly effective exceptions that stand out in the United States. The German merchant is as inefficient as the manufacturer is efficient. The chain store is practically unknown and installment selling is just making a small start.

Labor conditions are unhealthy. Unionism is complete, wages are low, and production is held down to the rate of the poorest worker. Germans believe the American system of high wages is fallacious. If German can overcome this attitude and adopt the spirit as well as the mechanism of American industry she will be a force to be reckoned with.—C. B. Thompson, *The Magazine of Business*, June.

Grinding Worms in a Lathe

Form grinding of worm threads at the Gleason Works is done in a standard engine lathe that is provided with a special carriage and an individually driven grinding head. The worm to be ground is mounted on an arbor which is held on the lathe centers and driven by a dog in the usual way. Each worm to be ground requires a special arbor with a thread, or worm, of corresponding pitch made integrally a part of it. When in position on the lathe centers the arbor passes through a housing that is permanently a part of the special carriage and provided with means to hold and operate interchangeable half-nuts to correspond with the master-thread of the arbor in use. As the housing is a part of the carriage upon which the grinding head is mounted, a rotative movement of the arbor causes the grinding wheel to follow the threads of the worm to be ground.

The grinding head is made as a slide-rest, provided with means of adjusting the wheel to and from the center of rotation and longitudinally with respect to the work; both movements being actuated by micrometer-graduated screws to facilitate close setting. The wheel may also be tilted to any desired helix angle. A diamond-holding slide is made a part of the wheel head so that the wheel may be accurately form-dressed as often as need be.—*Machinery*, June.

Departmental Metering Practice in Industrial Plants

Power costs may or may not be a prime factor in determining the profits or the sale price of a manufactured article, but in the majority of plants these costs are becoming more important as production is speeded up. Metering the electric power delivered to the various departments of an industrial plant takes the pulse beat, so to speak, of each member of the plant family, so that each department may be placed on a sound footing from the standpoint of operation, and encouraged to better endeavor. Departments should be charged with the power used to prevent waste of power, if for no other reason. Incentive is a great driving force if properly applied and when a definite billing is made against a department, an incentive is given to that department to reduce its power bill.

The monthly meter readings may be kept in a standard form of meter book, some of which provide space for the numerical dial reading, whereas others have a printed meter index for each reading so that lines drawn on the printed index indicate the exact position of the dial hands.

Before developing a system of metering for a plant in operation, a comprehensive survey should be made of the connected loads. These should be grouped to include the natural departmental divisions, such as power house auxiliaries, plant water pumping, machine shop, and allied facilities, and process groupings. The proposed grouping must next be reconciled with the existing electrical plant wiring diagram.—By J. Elmer Housley, *Industrial Engineer*, May.

Trend in Steam-Station Design

Since 1913, the consumption of coal per kw.-hr. has been reduced from 1.6 to 1.0 lb., present best average economy. This result has been influenced by several factors. Boiler pressures have risen from 225 to as high as 1,400 lb. per sq.in. in one case, while steam temperatures have risen steadily from 600 to 750 deg. F., with higher ones contemplated in the near future. Feedwater temperatures, never over 210 deg. F. with the atmospheric heater, now range between 300 and 375 deg. due to present methods of bleeding turbines at each stage, thereby improving also the performance of the machine. Air preheating to 500 deg. by means of flue gas exchange has also proved of value.

All these improvements have resulted in higher boiler ratings and severer

conditions than most furnace walls can stand. As a result, water-cooled walls are being used; in other words, the boiler itself forms its own furnace walls. Where fourteen years ago, 10,000 sq.ft. of boiler surface was large, one boiler, today, has 40,000 sq.ft. of surface. Turbine ratings have advanced at an even more rapid rate, almost ten times.

The increased use of powdered fuels is predicted.—Vern E. Alden, *Mechanical Engineering*, June.

A New Lifeboat-Launching Tractor

While caterpillar tractors have been used for some time in launching lifeboats from flat, sandy beaches, they have not proved suitable when launching is necessary from shingly beaches or beaches where soft mud and heavy boulders are encountered. For launching from any kind of beach, the Royal Lifeboat Institution (England) has had designed for it a new type of tractor fitted with a roadless creeper track. The launching ropes beneath the boat are attached to a winding drum on the tractor.

The tractor is powered by a Wisconsin motor that has been specially modified by the builder. The motor has an output of from 60 to 65 b.hp. at 1,350 r.p.m. There are two reverse speeds, and the forward speeds are 2, 3, 4, 6, 8, and 12 m.p.h. The winding drum has two speeds, and carries 250 ft. of ¾-in. wire rope. A hand brake is provided at the side of the chassis.

Since the tractor may be washed by waves during the launching operation, means have been provided to prevent water from reaching the vulnerable parts. The carburetor and the magneto are completely inclosed by watertight casing, and the air intake is placed eight feet above ground level. The valve stems are shrouded by guards, so that water can not easily penetrate into the motor. Although the motor is not fully waterproof, it would run for some time when fully submerged.

The front wheels of the tractor are equipped with large-sized Goodyear tires specially intended for heavy work. The main tracks are slightly over 16 in. in width and are spaced 4 ft. 10 in. apart. The distance between the front axle and the point of support of the creeper track is 8 ft. 9 in. and there is a further span of 22 ft. 5 in. to the tail axle under the lifeboat truck. The truck has been modified to carry creeper tracks, similar to those on the tractor. The tracks are 18 in. wide, and are over 9 ft. apart.

The total weight of the unloaded tractor and truck is 8½ tons, of which 1¾ tons is carried by the front axle, 5¼ tons by the central tracks and 1½ tons by the rear tracks. The boat has a total weight of 6¾ tons, practically all of which falls on the track supports, only about ¼ ton being carried on the turntable at the rear of the tractor. The tractor has been sent to the Dungeness station, where it will operate on a rough macadam road and a sandy beach strewn with boulders.—*The Engineer* (*England*), May 13.

Tests of Springs

Springs were tested in endurance by loading them to a known mean stress and oscillating them at their natural periods for the given loads through definite amplitudes. Where S_M is the mean stress, the extremes of stress will be $S_M \pm \frac{1}{2} S_R$, where S_R is the range of shear stress corresponding to the amplitude of oscillation. The maximum shear stress occurs on planes inclined at 45 deg. to the planes of principal stresses and is equal to half the difference of those stresses.

The tests showed that in the neighborhood of the limiting stress, a small decrease in stress is followed by a large increase in life before fracture, while an increase in stress is followed by almost immediate fracture. Defects in the wire not usually revealed by tension tests are important and have considerable effect upon the life of springs. The control of manufacture, including the drawing and heat-treatment, is of greater importance than chemical composition. Grinding of the wire before coiling is desirable, particularly for wire drawn to a high tonnage.

Creep of springs occurs when the maximum stress exceeds the proportional limit and increases somewhat rapidly with the maximum stress. It ceases if the stress does not exceed a certain limit, depending upon the mean stress.

A number of compression springs failed on the outside of coils on planes inclined at 45 deg. to the axis, where tensile stress has its greatest value. In other cases, however, failure appeared to be due to shear stress on planes parallel and perpendicular to the axis of the wire.—Prof. F. C. Lea and F. Heywood, *Engineering*, May 6 and 20.

High-Speed Steels

To the production engineer high-speed steels are of enormous importance, as it is only with their aid that he can maintain the production essential in modern shops. The original Mushet self-hardening steel had little in common with modern high-speed steel, but since 1900, when Taylor and White discovered the property of red hardness of the tungsten alloys, there has been a gradual improvement in high-speed steels.

High-speed steels are made in the crucible or electric furnaces. The modern tendency is to use the electric furnace. In the latter, excellent opportunities are afforded for refining operations so that cheaper raw materials can be used. In England, high-speed steels are usually classified according to their tungsten content, as 14 per cent and 18 per cent tungsten steel.

The 14 per cent class of steels find use in tools in which the ability to resist stresses is of equal importance with cutting properties, such as twist drills, reamers and dies. The 18 per cent class possesses the property of cutting under more strenuous conditions, but is more brittle, and should be used only where the cutting edge can be backed up. In America the use of high-speed steels is confined almost exclusively to the 18 per cent tungsten class. This is surprising, since the cost of 14 per cent steels is about 20 per cent lower than that of the 18 per cent class, and twist drills of 14 per cent tungsten steel are capable of very high-speed work.

Generally, there is a similarity between compositions of American and English 18 per cent tungsten high-speed steels, the only real difference is that in the American steels the carbon content is 10 to 15 points higher than in English steels. The usual compositions of 18 per cent steel are as follows: Tungsten, 16.5 to 18 per cent; carbon, 0.6 to 0.65; chromium, 3 to 4; and vanadium, 0.5 to 2.25 per cent. The super high-speed steels are steels in which 1 to 2 per cent of molybdenum and 5 per cent of cobalt are added to the 18 per cent class.

To develop the property of red hardness, it is necessary to heat the tool above 2,100 deg. F., the exact temperature depending upon the carbon content. Immediately after the tool has attained the high heat, it should be removed from the furnace and cooled in still air. All high-speed steels, after hardening, should be tempered at 1,020 to 1,100 deg. F., at which temperature the maximum secondary hardening is developed.—F. C. A. H. Lantsberry, *Transactions, A. S. S. T.*, May.

Waste-Packed Bearings

Cotton materials, so superior in lifting and feed capacity to felt or wool, are unsuitable as packing for bearings because they glaze readily and soon jar out of contact with the journal due to lack of resiliency. Wool alone or a mixture of wool and cotton can be used successfully, however.

The flow of oil increases rapidly with a rise in temperature due to the change in viscosity. The height to which the oil must be lifted should also be taken into account. The actual quantity of oil in the box is not as important as its level be near the "window" of the journal. The performance of a waste-packed bearing does not depend upon the amount of oil flowing through it, provided there is sufficient oil to keep the clearance full. In this type of bearing the wick does not supply sufficient oil to build up enough hydrostatic pressure to raise the journal free of the shell. Instead there is actual contact between the journal and shell, the area depending upon the eccentricity between them. Friction is made up of two parts: that in the oil film and that in the contact area, which for this reason should be as smooth as possible.

For these bearings the maximum pressure is about three times the average pressure on the projected area. The load-carrying ability is important and the bearing should be designed to favor film formation. The window should be placed in the vacuum zone, therefore, and the packing should cover the whole window so that it is completely sealed. The location of grooves in the pressure zone is detrimental as it breaks the oil film in two parts, thus throwing more load on the contact area and increasing the friction.—G. B. Karelitz, *Mechanical Engineering*, June.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Another Ocean Flight

AGAIN the Atlantic Ocean has been crossed by airplane. A good pilot, aided by the skill of the builders of plane, engine, instruments and other equipment, has once more proved the reliability of modern mechanisms and their possibilities in long distance transportation.

That Capt. Lindbergh deserves and will receive the greater credit, just as Columbus is better known than any who followed him, is no reflection on Clarence Chamberlin, except so far as the superior navigation of the former enabled him to reach his goal without stop or delay of any kind. With planes that are very much alike, with the same engine and much of the same instrument equipment, and with similar weather conditions, the difference in time and fuel consumption shows clearly the necessity of good navigation as a part of long distance flying. The best of pilots must know where he is headed just as the steersman of a steamship must follow the correct course to reach his destination.

Both of the recent trans-Atlantic flights have demonstrated that airplane design and construction have reached a high point. They show that the modern airplane engines can be depended upon to function continuously hour after hour at various altitudes and under unfavorable weather conditions. Both Lindbergh and Chamberlin have proved themselves pilots of unusual ability and endurance and both deserve great credit for the courage with which they faced the dangers that confronted them.

It must not be forgotten, however, that back of both these flights, and back of all the progress that we call civilization, stand the men who design and build the machines that make possible the production of airplanes, engines, and all the rest.

Two Weeks Delivery!

PROCRASTINATION used to be the thief of time, according to the school text book. Now it also demands toll of everyone in business. And procrastination in placing orders not only filches time but also all that goes along with it—including dividends.

When a man wants a pair of regular socks he naturally expects to be able to get them out of stock. But if he demanded an odd size, a certain weave, and color combinations to suit his individual fancy, he would expect to order them a long time before he needed them. But when he buys machinery, which is nearly all more or less special at present, he expects to pick it off the shelf, and thereby hangs many a tale of grief.

Builders say that nearly every order at present demands delivery within two weeks, regardless of whether the machine is of standard design or has variations as to motor drive, gearing, or special feeds. Instead of placing the orders to give time for machines to come through in their regular sequence, two weeks now seems to be the time set for delivery almost regardless of the kind of machine ordered.

When a customer demands two weeks delivery as a condition of the order and the salesman or dealer passes it on to the manufacturer, he is adding to the cost of doing business. But unless business is very much better than usual, it takes a lot of nerve to refuse the conditions named, even though it means upsetting shop routine and adding materially to the cost of the machine.

The usual procedure is to accept the order in spite of the conditions and then attempt to get the machine out on time. Men are taken from their regular work to help get out the new order. Some must work overtime at the usual increase in hourly rate and other unwarranted expenses creep into the cost records until profits become badly emaciated if indeed they do not entirely fade out of the picture. When the strain is over and the order shipped the builder asks himself if it is worthwhile—and then usually proceeds to accept the next "two week" order.

Thawed Credit

THOSE who find it hard to discover the reasons for the continuance of prosperity in the United States overlook one of the most important ones, the thrawing of frozen credits made possible by greatly improved transportation service. Stocks on hand and inventories have been reduced to a fraction of their former size because of the short time needed to get raw materials from producers.

One western New England company, for example, gets its steel from Boston overnight, by freight. A plant of one of the big steel combinations has reduced its capital $21,000,000 without lessening its business, because of improved transportation. It is estimated that the lumber industry alone has reduced its stock account by $600,000,000.

With this condition extending generally throughout industry it is no great wonder that production is more uniform, employment is more regular and prosperity continues.

Shop Equipment News

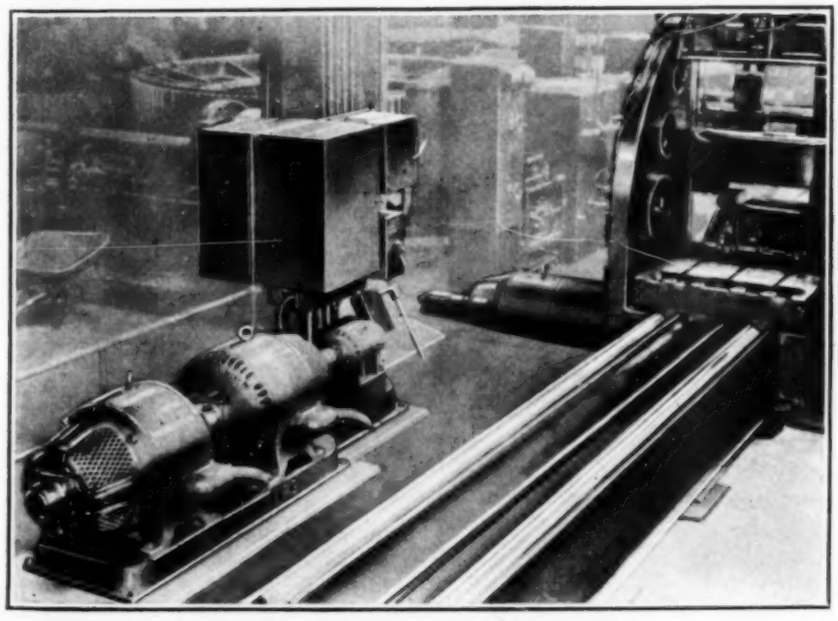
Allis-Chalmers Ultra-Speed Planer Drive

A NUMBER of unusual features are claimed for the ultra-speed planer drive recently developed by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis. The drive is shown in the illustration applied to a typical planer. The outstanding features claimed for this drive are: a much greater range of speeds than heretofore attained; namely, a cutting speed of 10 to 85 per min. with full torque available and fifty or more intermediate cutting speeds; a return speed of 180 ft. per min.; automatic operation with improved type of pendant control; complete safety to operator, planer and work; extreme overload capacity; and adaptability to operate on either direct or alternating current.

It is said that the increased range of speeds is attained with greater smoothness in acceleration and reversal and with less wear and tear on the equipment than on previous drives made by this company. The electrical apparatus was designed with the mechanic's limited knowledge of this type of equipment in mind; hence the details of the control were selected so that the apparatus could be operated and adjusted with a minimum number of movements. In addition, a special safety device prevents any part of the equipment or planer being injured should the power supply be shut off.

The planer motor is of special design to withstand the severe strains of reversing planer service. The rotating parts have low inertia and are dynamically balanced. Good speed regulation is claimed, particularly in the low cutting speeds. It is also claimed that the motor-generator set which drives the planer motor has ample reserve power.

In order to test the smoothness of the drive, a steel bar, 1½ in. in dia. and 9½ in. long, was placed on end on the table while it was fed forward at the rate of 20 ft. per minute and returned at the rate of 180 ft. per min. with a 6-ft. stroke. The bar did not fall over at either end of the stroke.



Allis-Chalmers Ultra-Speed Planer Drive

"Forged-Cast" Gears

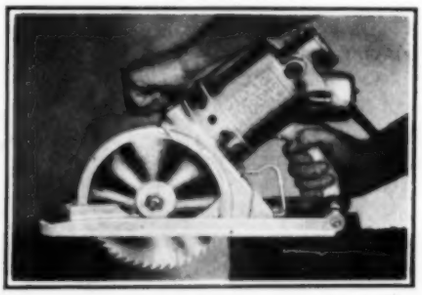
The Hill Clutch Machine & Foundry Co., Breakwater Ave. and West 65th St., Cleveland, Ohio, has developed a gear design using a forged steel rim, in which the teeth are cut, and a semi-steel hub. The construction is simply an angular forged ring in which is cast a hub either with web or arms, depending on the dimensions. After casting, the completed gear is finish machined and the teeth cut. The forged ring is made of tough steel and it is claimed that sound homogeneous teeth result. The junction of the steel rim and the semi-steel center is a laminated weld of steel and iron and the finished gear is one integral piece.

The thickness of the forged steel rim is proportioned to the teeth. Any height of tooth or width of face can be cut. The hubs have both ends faced and are taper key-seated. Gear-pin hubs, special bolting lugs and other unusual features can be applied to this type of gear.

Wallace Electric Handsaw

The electric handsaw illustrated has been added to the line of portable tools made by J. D. Wallace & Co., 134 South California Ave., Chicago, Ill. It is designed to handle all kinds of work ordinarily done with a handsaw.

The universal type of motor makes it possible to use the handsaw on either direct or alternating current, any frequency. It is impossible to overload the machine as only one size of saw can be used with it. This is a standard round-hole blade, 8 in. in diameter. Ball bearings are used throughout, all of the same size and of standard make. The gears run in grease.



Wallace Electric Handsaw

A particular feature is the saw guard. Ordinarily this is locked in position so that the blade is entirely covered and when the operator wishes to cut he releases the safety guard by means of a trigger con-

Shop Equipment News

veniently placed near the grip. When the cut is finished and the saw is lifted from the work, the safety guard or shoe automatically drops and locks in position and will not open again until released by the trigger. When the machine is in use the blade is covered at all points above the point of work. It is said that this patented guard has been accepted as standard by the Underwriters' Laboratories.

The design of the saw in general is compact and convenient. One handle is of the type found on an ordinary handsaw, and the other similar to that used in guiding a hand plane. Both are close to the point of work, insuring accuracy and ease of operation. A splitter follows the saw blade, dropping into the cut, and helps to guide the machine. An indicator in front makes it possible to follow a line, and the shoe is machined on one side to follow a guide.

With the depth gage provided, the saw can be set to cut accurately to any predetermined depth.

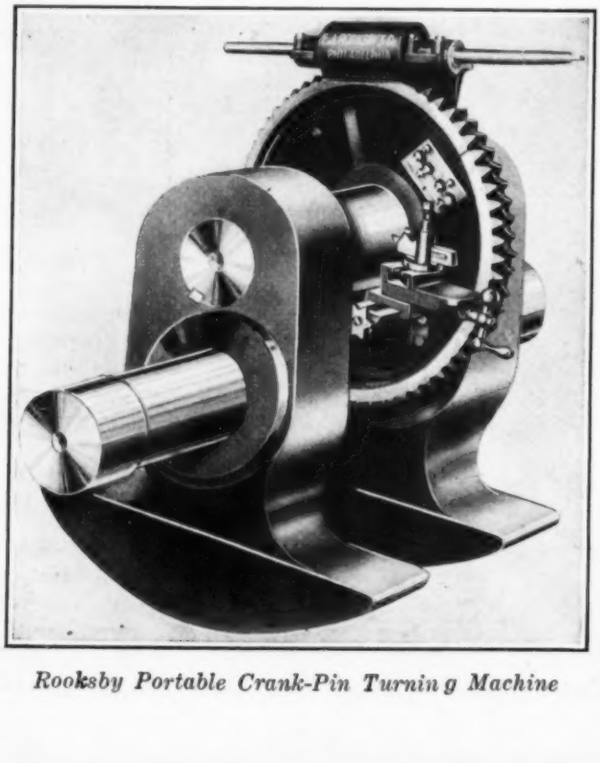
Rooksby Portable Crank-Pin Turning Machine

A MACHINE for truing up worm center crank pins of locomotives has recently been designed and placed on the market by E. J. Rooksby & Co., 1042 Ridge Avenue, Philadelphia, Pa. The machine is shown truing up the center crank pin of a 3-cylinder locomotive of recent design, but the unit is equally adaptable to any center-crank engine, whether steam, gas or Diesel, and for stationary or marine engines as well.

The machine consists essentially of a stationary and a revolving disk. The revolving disk is supported in the stationary one by a keeper ring which provides both a journal bearing and a thrust bearing. The stationary disk is secured to the inside face of the crank cheek by adjusting screws, studs and clamps. The revolving disk is driven by a worm gear, which, in turn, is driven by a pneumatic or an electrical motor. This disk carries a substantial arm with a slide block and cross-slide having a tool post and turning tool, which can be fed in both directions on the pin by means of a star wheel. The cross-slide construction is similar to the slide block of a lathe and the adjustment is similar.

Both the disk and the keeper ring are split in order to place the machine over the crank pin. The joints between the two halves are provided with a tongue and groove accurately machined and carefully fitted so that they may be readily assembled on the crank pin, while at the same time accuracy is maintained.

The machine is bolted to the finished inside cheek of the crank, squaring it with the pin. Provision is made for setting to the original center by a supporting cross bar with a center and sleeve having screw adjustment, similar to the tailstock of a lathe. These parts are not shown in the illustration. In this way the machine can be set square and central with the original pin.

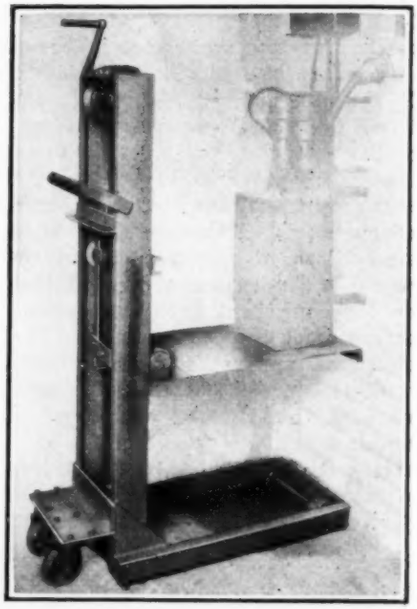


Rooksby Portable Crank-Pin Turning Machine

The machine has a capacity for turning crank pins from 8 to 11½ in. in diameter, and from 7½ in. to 9 in. in length.

Lewis-Shepard Hand-Power Elevating Device

The small hand-power elevating machine shown in the accompanying illustration has been made by the Lewis-Shepard Co., Watertown Station, Boston, Mass., for use in elevating heavy appliances, such as the controller shown, in the position it will occupy on the wall. While held in this position, the piece can readily be attached to the wall.



Lewis-Shepard Hand-Power Elevating Device

Gardner No. 87 Special Double-Head Disk Grinder

The Gardner Machine Co., Beloit, Wis., has built the No. 87 special double-head disk grinder, shown in Fig. 1, for finishing the opposite sides of large boiler sections of the type shown in Fig. 2. It is claimed that this is one of the largest disk

Shop Equipment News

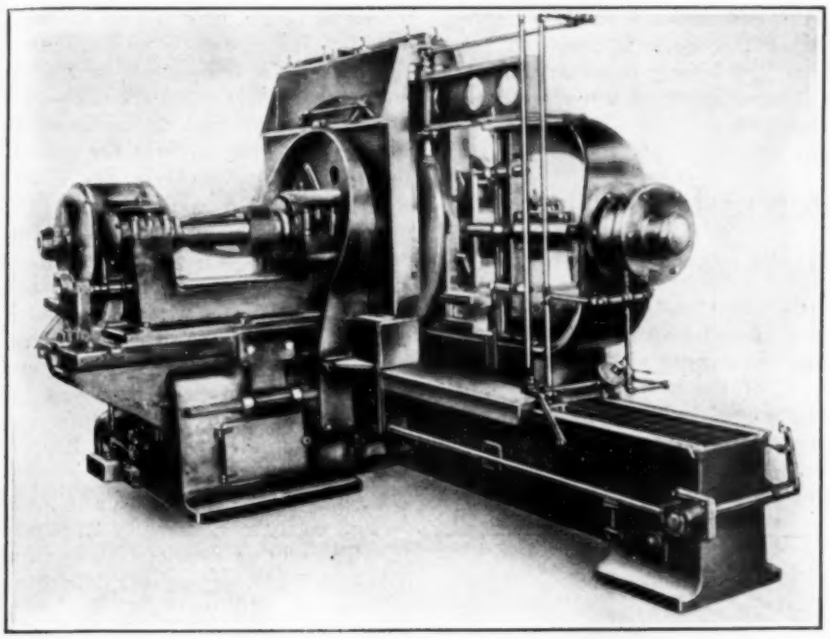


Fig. 1—Gardner No. 87 Special Double-Head Disk Grinder

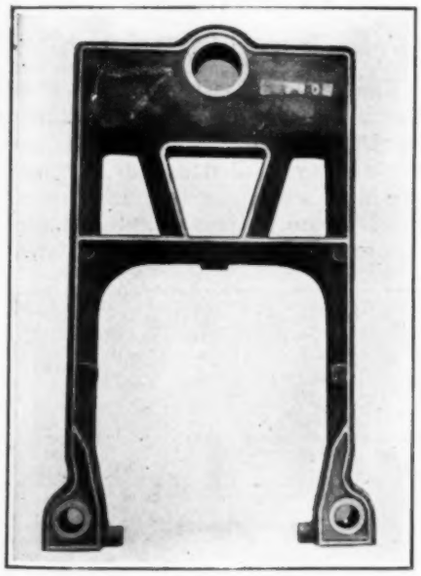


Fig. 2—Typical boiler section ground on the machine

grinders ever built. It occupies a floor space of approximately 19x11 ft. and it is 7½ ft. high. The disk wheels are 53 in. in diameter.

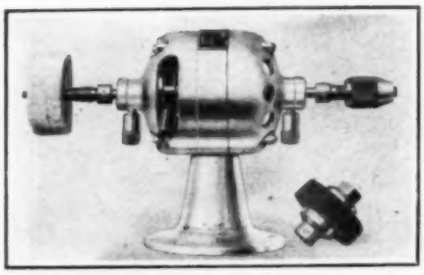
The work is carried on a special fixture, equipped with air-operated clamps, and the whole is carried on a cross feed slide, operated by an Oilgear hydraulic feed. The infeed of the work to and from the grinding members is therefore automatic, and the operating mechanism is said to be quickly and easily controlled. A production of 24 sections per hour, floor to floor time, is claimed. The tolerance on parallelism is 0.006 to 0.012 inch.

Each grinding head is driven by a separate electric motor through the medium of a silent chain.

Goodell-Pratt Grinding and Polishing Heads

The Goodell-Pratt Co., Greenfield, Mass., announces the addition of two small size, high-speed, motor-driven polishing and buffing heads to their line of electric tools. The machines are suitable for a wide variety of light polishing, grinding, buffing and drilling work.

The motors are of the universal type for use on any 110-volt circuit. Machine No. 1,060 develops about 1/30 hp. and is shown in the illustration. Machine No. 1,061 is similar in construction, but develops about



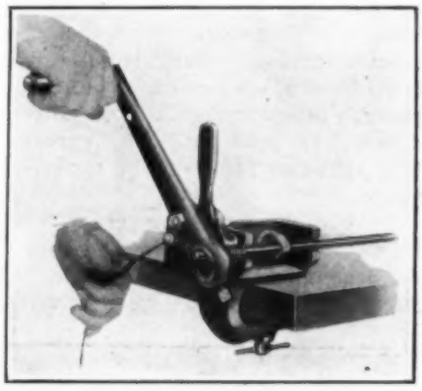
Goodell-Pratt No. 1,060 Grinding and Polishing Head

1/20 hp. Both heads have polished aluminum stands and housings. The spindles are 3⅝ and 4¼ in. high, respectively, and are equipped with a taper thread spindle on one end and an interchangeable arbor and 3-jawed chuck of 3/16 in. capacity on the other. A grinding wheel and cloth buffing wheel, both with ½ in. face, are supplied as regular equipment.

Fostoria Spring Winder

The spring winder shown in the accompanying illustration has been developed by the Fostoria Screw Co., Fostoria, Ohio. With this device, it is claimed that any coil spring ranging from ⅛ to 1¼ in. in outside diameter and using any gage of wire, from the finest piano wire to that ¼ in. in diameter, can be wound in a few minutes time. The coil may be of any length and pitch, either right or left hand, and of either the compression or expansion type.

The size of the spring depends upon the size mandrel over which the



Fostoria Spring Winder

wire is wound, while a tapered cam determines the lead or pitch. One mandrel, 7/16 in. in diameter, is regularly supplied together with a wrench.

Stewart Tempering Salts

The Chicago Flexible Shaft Co., 5,600 Roosevelt Road, Chicago, Ill., is supplying Stewart tempering salts in 50-lb. tins. These salts are recommended for tempering and drawing steel at temperatures ranging from 300 to 1,000 deg. Fahrenheit.

The salts are claimed to be unburnable, non-poisonous, smokeless,

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and odorless. They are instantly soluble in warm water. Any pot type of furnace can be used with the salts, the only requirement being that the pot be absolutely clean, and for this reason a new one is preferred.

After the work is removed from the bath, it is only necessary to rinse it in warm water to remove all trace of the salts.

Syntron Portable Electric Industrial Power Units

THE Syntron Co., Pitsburgh, Pa., makes two types of portable electric power units for general use. In one of the types, a 2-cylinder, water-cooled engine developing 2 hp. is used. The crank shaft is the opposed-throw type to eliminate vibration, and is mounted upon Timken roller bearings. Manhole plates give easy access to the connecting rods and oil pump without removing the engine from the frame. The motor is said to be easy to start as it has an automatic impulse starter on the magneto. It consumes 4 gal. of gasoline in 8 hours constant duty.

Designed to operate with this motor is a self-exciting generator specifically designed for portable service. The armature is mounted upon ball bearings, lubricated by Alemite fittings. Sufficient current is supplied to operate nearly all light portable electric tools. Two power outlets are provided. The current is supplied at 110 volts, 30 cycles, 2 phase.

In Fig. 1, is shown this Type PT230 unit, mounted on a trailer for attachment to an automobile. A folding leg is supplied that permits the unit to stand level when in use, and a rear bumper is furnished to avoid the danger of upsetting. The weight of the unit has been so balanced on the wheels that it is said that one man can manipulate it with ease. The wheels are mounted upon roller bearings, and can be supplied with solid or pneumatic tires. A steel hood completely covers the engine and generator so that the unit is unaffected by weather conditions. Two tool boxes, 34 in. long, 12 in. wide, and 12½ in. deep, provide carrying capacity for accessories.

The same unit can be supplied on skids with handles for carrying or lifting it up on, or down off a truck.

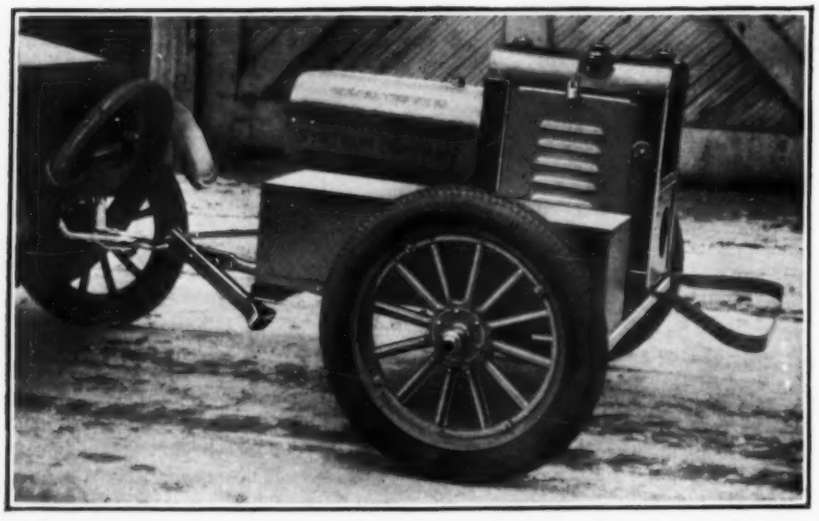


Fig. 1—Syntron Type PT230 Portable Electric Power Unit Mounted on Trailer

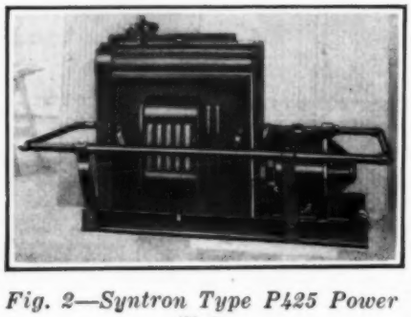


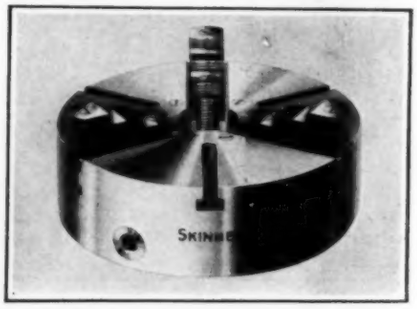
Fig. 2—Syntron Type P425 Power Unit

A 4-cylinder, 4-cycle model, known as Type T425 and shown in Fig. 2, is also made. It is direct connected to a generator and is designed to furnish sufficient current for operating heavy-duty electric tools and equipment. For railroad use, the unit is mounted on skids with two double flanged wheels so arranged as to permit setting on a rail and pushing to the work position. A railing of steel tubing completely surrounds the plant at the proper height to minimize lift and to facilitate handling. This unit can also be supplied on a trailer, if desired.

The Type T425 unit weighs 1,000 lb. and occupies a space of 27x48x78 in. The engine develops 15 hp. and drives a 7 kw. generator, delivering current at 110 volts, 25 cycles, 2 phase.

Skinner Heavy-Duty Scroll Chuck

The Skinner Chuck Co., New Britain, Conn., has placed on the market as standard equipment an extra-heavy, all-steel-body, three-jawed universal scroll chuck that it has hitherto supplied only upon special order to makers of certain types of standard turret and chucking machines.



Skinner Heavy-Duty Scroll Chuck

The chuck was designed primarily to allow full advantage to be taken of the increased power and productive capacity of the machines for which it was built, and the only change necessary to convert it to a standard appliance was to make it with a back recessed for the usual type of attachment plate instead of a special back with collar integral.

In addition to making the body of steel, the screws that hold the

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component parts together have been increased both in number and in size. One set of these screws enters through the back-plate and tap into the chuck body at the point of greatest permissible radius, while the heads of the other set are counterbored flush with the chuck face between the jaws, and tap into the backplate, thus giving double support.

All working parts of the chuck are of steel, hardened and ground. A hardened steel ring bearing behind each pinion sustains the radial thrust of the pinions while the jaws are being tightened upon the work. All parts are made to standard gages and are replaceable.

This chuck is now available in 12, 15, 18, 20 and 22 in. sizes.

Bear Instruments for Checking Automobile Wheels

THE Bear Manufacturing Co., Rock Island, Ill., is marketing a number of instruments for detecting and correcting wheel troubles on automobiles. In Fig. 1 is shown an axle gage for determining the castor of the front axle to insure proper wheel alignment; that is, most front axles are tilted backward to add stability to steering and to prevent "shimmy" and the instrument measures this tilt.

The axle gage operates on the principle that the arc of a circle described by the end of the wheel spindle lies in a plane parallel to the top of the axle. The gage pointer, therefore, is placed in the spindle center and the wheel is swung first to the right and then to the left. The dial is graduated to read direct in degrees of tilt, and a spirit level is used to insure accurate placement of the gage. The instrument will work on all models of cars, and a chart is provided showing the manufacturer's specifications for castor on each model.

The wheel aligner is used to check both the pitch (dish) and the toe-in of front wheels and the alignment of rear wheels. It is shown in Fig. 2 in position for measuring the toe-in. It is also said to detect faulty wheels,

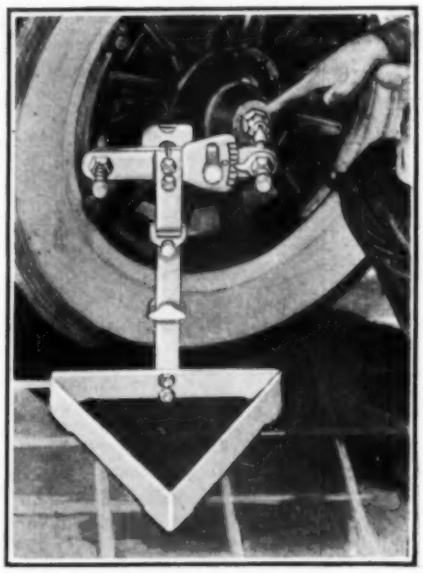

Fig. 1—Bear Axle Gage

spindles, bolts, bushings, tierods, and axles. The device is held in position by a compression spring and hence will support itself there, while corrections are being made.

Two-way spirit levels are used to align the apparatus and direct-reading dials measure the toe-in or the pitch in inches. For measuring toe-in, the aligner is placed between the wheels as shown with the abutment bars horizontal and at the same distance from the floor. By adjusting one dial to zero, the operator can read the toe-in direct on the other. For measuring the pitch, the abutment bars are placed in a vertical position. Wobble can also be measured with the bars in this position.

In Fig. 3, the tracking gage is shown. Its use is obvious from the illustration. The wheel aligning gage must be used in conjunction with it to position the front wheel.

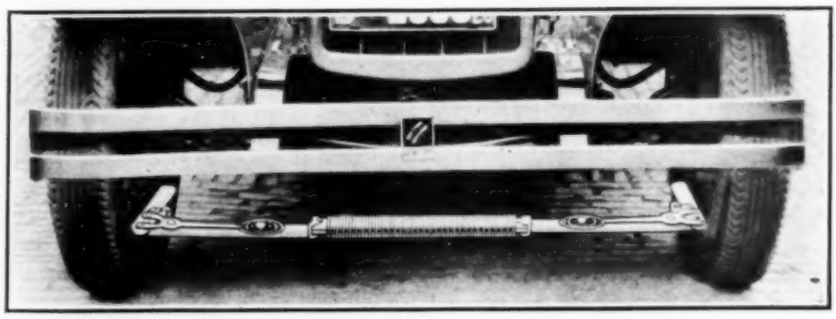

Fig. 2—Bear Wheel Aligning Gage

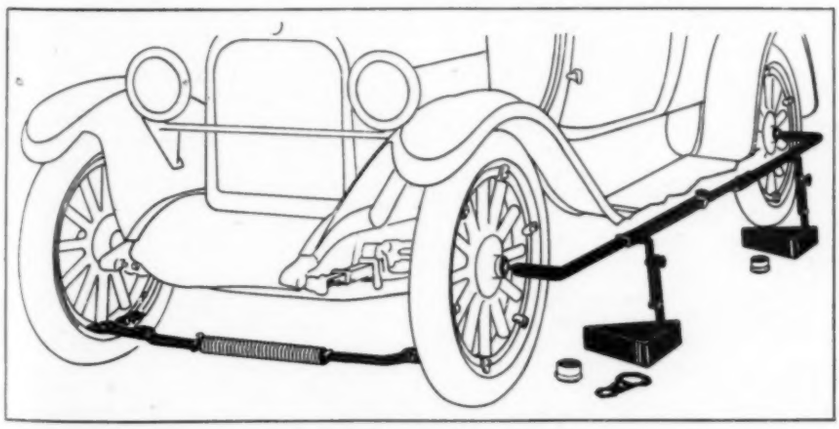

Fig. 3—Bear Tracking Gage

De Mattia Variable-Speed Transmission Unit

The illustration shows a 1-hp. variable-speed transmission unit made by the De Mattia Brothers, Inc., Wellington St. and Getty Ave., Clifton, N. J. It is claimed that any desired speed through a range of 10 to 1 can be obtained accurately. The speed is varied between high and low by means of push-button control which can be located at any convenient position.

The unit shown was designed to

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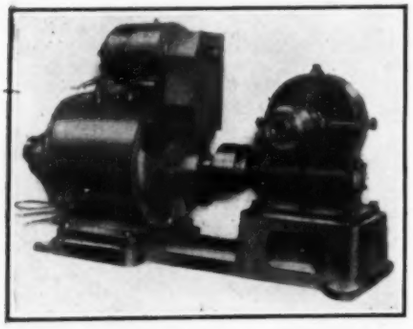

De Mattia Variable-Speed Transmission Unit

operate a conveyor 150 ft. long, for taking rubber tubes away from a tube machine. The output shaft ordinarily rotates at 4 r.p.m. and the input shaft at 40 r.p.m., but any speed between the two limits can be obtained at the output end.

The outfit consists of a driving motor and a worm reduction unit connected through a Francke flexible coupling, the whole being mounted on a common bedplate. It is claimed that the unit is quiet and efficient in operation, and that the speed range can be accurately controlled.

Trade Catalogs

Belting. The Chicago Belting Co., 113 N. Green St., Chicago, Ill., has issued a 96-page catalog of its products. The manufacture of leather belting is described and complete instructions for the operation and maintenance of belting is given. Other mechanical leather goods are also described and illustrated. Engineering information is appended.

Circuit Breakers. The General Electric Co., Schenectady, N. Y., has issued two publications on station oil circuit breakers. Bulletin GEA-101A describes the types FK-, FKO-, FHK- and FHKO-236, while bulletin GEA-706 describes FK-230 and FHK-230 types. The pamphlet is well illustrated throughout with photographs, as well as cross-sectional views. Constructional features are pointed out and the operation of each unit is explained.

Milling Machine Arbor. The Kearney & Trecker Corporation, Milwaukee, Wis., has issued an illustrated circular describing the manufacture of the new standard milling machine arbor. Complete specifications of the various styles of arbors are included.

Motors, Electric. The Master Electric Co., Linden & Master Aves., Dayton, Ohio, has published a bulletin describing its Super-Wick motors which recently appeared on the market. Most of the text and illustrations are devoted to explaining the method of lubricating the journals by wicks. A general description of the motor is also included, as well as a tabulated list of claims for this type of motor.

Motors, Electric, Flynn - Weichsel. The Wagner Electric Corporation, St. Louis, Mo., has published bulletin No. 144 on the Flynn-Weichsel motors. This pamphlet contains sixteen 8½x10¾-in. pages and is well illustrated throughout with photographs and charts. The disadvantages of motors operating with low power factor are contrasted with the advantages of those operating with a high power factor. The starting, running and overload characteristics of these motors are emphasized.

Nickel Cast Iron. The International Nickel Co., Inc., 67 Wall Street, N. Y., has published in pamphlet form a series of advertisements featuring ten properties of nickel cast iron in the following order: Finer grain, increased hardness, uniformity, increased strength, with decreased chill, increased hardness with decreased chill, better machinability with greater hardness, greater strength with better machinability, stabilized machinability, and increased wear-resistance. Each ad is illustrated with photographs and charts.

Platforms. The Barrett-Cravens Co., 1,328 W. Monroe St., Chicago, Ill., has issued Bulletin No. 250 on its Steeleg platform. The chief constructional differences between the various types of platforms are brought out by means of cross-sectional views. Sketches of suggested platforms for special uses are also given.

Pulleys. The Pyott Foundry Co., 328 N. Sangamon St., Chicago, Ill., has recently prepared seven direct-mail folders of unusual design. Multi-colored pictures depict scenes of the Spanish Mian, South Sea Islands, China, Egypt, and other places. The text ties up the illustrations with some particular feature of the cast-iron pulleys made by this company.

Special-Purpose Machine Tools. William K. Stamets, Jenkins Arcade Bldg., Pittsburgh, Pa., has issued an illustrated circular showing some of the special-purpose machine tools designed and built by the engineering staff of the Stamets Organization.

Steel, "Jalcase." The Jones & Laughlin Steel Corporation, American Iron and Steel Works, Pittsburgh, Pa., has issued an illustrated leaflet pointing out some of the advantages of the special steel "Jalcase" recently developed by this company.

Transmission, Variable-Speed. The Reeves Pulley Co., Columbus, Ind., has available for distribution an illustrated circular describing its new electrical remote control for its variable-speed transmission. Various constructional features are pointed out and the operating advantages are cited.

Pamphlets Received

Agricultural Implements, Foreign Markets, 1926. The U. S. Dept. of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C., has available a pamphlet entitled, "Foreign Markets for Agricultural Implements" by Charles D. Martin, Assistant Chief of the Agricultural Implements Division. This is known as Trade Information Bulletin No. 488 and may be obtained from the Supt. of Documents, Government Printing Office, for 10 cents. The market situation for this class of goods in all the principal countries of Europe, Asia, and the South Seas are briefly described. The information is summarized on the last page for comparison with figures obtained in 1925.

Method for Determining Magnetism of Steel

An idea of the importance of magnetic testing, from a commercial point of view, can be gained from the estimate that in the year 1925 approximately ten million dollars worth of material was purchased in the United States on the basis of specifications as to its magnetic quality, according to the Bureau of Standards. A considerable proportion of this material consisted of sheet steel used in the construction of electrical machinery and apparatus.

It is very important that acceptance tests on this type of material be made on an accurate and uniform basis. Tests of the magnetic property of steel are being made at the bureau with an instrument known as a "permeameter" because it determines the magnetic permeability of the specimen.

The bureau recently carried out an investigation, described in Scientific Paper No. 545, which has just been issued, to determine the relative merits of the two methods in most common use for the magnetic testing of sheet steel and to find out the conditions under which the best results can be obtained. It was found that the principal source of error lies in non-uniformity in the material itself, and that the Fahy Simplex permeameter is less sensitive to this condition, and is more satisfactory for the general line of work, than the Burrows permeameter which has for some time been accepted as the standard method. Copies of this paper may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at ten cents each.

The Division of Simplified Practice of the Department of Commerce announces that the committee that has been in charge of the recommendation for die head chasers (self-opening and adjustable die heads) has reaffirmed the existing schedule without change for another year.

NEWS OF THE WEEK

Maladjustment of Capital and Markets Is Chief Economic Difficulty

Concluding recommendations of the Geneva Conference

By Edward J. Mehren
Vice-President, the McGraw-Hill Publishing Company, Inc.

CLOSING its session on May 23 after three weeks of continuous work, the International Economic Conference, meeting at Geneva, adopted a long series of recommendations on commercial and agricultural topics and three on industrial subjects.

On the whole, the conferees were quite well pleased with the results. The task was a large one, the problems complicated and the views quite divergent on many points. A goodly degree of accord has been reached. Compromise has been necessary on many items but the result, on the whole, furnishes a good basis for further international economic co-operation.

No Immediate Results

How speedily the recommendations can be translated into action, where definite action is proposed, can not be foretold. Immediate results must not be expected. The issues would require much time even if only national action were required, but there are various agencies for forwarding the work, such as the economic section of the League of Nations, the International Chamber of Commerce, the International Institute of Agriculture, the International Management Institute, etc. Further, meetings of responsible ministers of the various countries will certainly be convened to consider agreements on various points covered in the recommendations.

Aside from any definite early action there are certain general advantages that should not be discounted. There is now a clear view of the economic ills of the world, and agreement upon remedies, so far as variant national interests would permit. Then there is this great advantage, that ministries can quote the Geneva conclusions in support of sound economic policy and legislation and in opposition to the unsound.

This very advantage was one of the great benefits of the Brussels financial conference. The conclusions of that meeting seemed to us in America obvious and simple. Yet, representing the ablest financial counsel in Europe, finance ministries were able to quote the conclusions as authority in getting sound fiscal legislation and policy. If, therefore, in America we think many of the Geneva conclusions to be extremely simple we must bear in mind that the principles are being violated and that authoritative statement will consequently be of great value.

Not all of the economic ills of the world were surveyed at Geneva. The pressing question of the disposal of surplus populations was not touched, due to the fact that it is too political. No attention was paid—or practically none—to the economics of distribution, to the problem of decreasing the spread between manufacturing cost and ultimate selling price. To this problem we are devoting much time in the United States. But, as it was, the agenda was crowded and many topics set down received no attention.

In cable messages and previous articles summaries have been given of the economic situation as presented to the conference and of the resolutions which have been adopted. There remains here chiefly to give more completely the resolutions on industrial pools and rationalization.

Before doing so, it is worth-while to give the readers of *American Machinist* an opportunity of reading the conference's own summary of the economic situation, as set forth in the preambles of the report of the Committee on Industry. [In previous articles Mr. Mehren has given his own summaries of the situation as the points were developed by speakers.]

Said the Committee on Industry:

"The chief difficulties now experienced result from the facts that in certain countries sufficient capital has not been available or that, with existing restrictions and under present conditions, the available markets are inadequate for the productive capacity in a number of the principal industries. This maladjustment results from many causes and takes various forms. There is a maldistribution of plant and equipment. In those countries which participated actively in the war, plant in many industries was increased for military purposes beyond the scale of what is required in peace; in other countries, new plant was installed to produce goods which could not be imported during the war; and the experience of war deprivations has developed a desire on the part of a number of nations to make themselves self-sufficing. Moreover, the general impoverishment of Europe immediately after the war lessened savings and handicapped industry by reducing at once the purchasing power of its clientele and the possibility of financial assistance from European money markets.

"Other causes have tended to a new distribution of manufacturing equipment; certain discoveries, for instance, have brought about a change in the use of raw materials or in the utilization of sources of energy and a displacement of industrial centers. The normal development of certain repair and finishing industries in partially industrialized non-European countries, and the effort in Europe itself on the part of certain nations with rapidly growing populations to increase their industrial equipment with a view to providing work for an ever-increasing number of individuals, have operated in a like direction.

Changes in Conditions

"The war indirectly increased the influence of these causes of instability. It increased the desire of various nations to work up in their own territories the raw materials they produced; it augmented the number and the magnitude of the obstacles placed in the way of the movement of goods by tariffs and prohibitions and of the movement of persons by immigration laws, by passport regulations and by restrictions on the right of establishment in the case of foreigners. Finally, the changes made in the structure of the economic organism as a result of alterations in frontiers, the laborious readjustment of international relations, and the insecurity of the financial and monetary situation have further retarded or impeded the efforts by which the European nations have endeavored to restore order in their industrial economic life.

"Of these causes, some are no longer operative, though their effects may last after them. The danger of great immediate additions to equipment in industries where plant is already excessive is slight in the principal industrial countries; the will to save is being revived and the supply of capital grows steadily; exchange fluctuations are now confined to a few currencies and within much narrower limits than heretofore.

"Other causes—which were noticeable before the war—particularly the growth of industries in hitherto only partially industrialized countries, etc.—must be considered as permanent and in the new world situation susceptive of direction only within restricted limits.

This is the fourth of a series of articles written for the *American Machinist* by Edward J. Mehren, who attended the World Economic Conference as the Editorial representative of the McGraw-Hill publications. Mr. Mehren's next article will appear in an early issue.

"It is on a third category of factors that the Conference has had to concentrate its attention, namely those which by their nature can, in existing circumstances, be appropriately modified. Of these the most important are the restrictions and control of the movement of goods and persons and, above all, those which result from tariff and commercial policy.

"Finally, owing to the growing facilities for transport and the constantly increasing number of raw materials required for industrial production, the natural development of industry is towards greater international intercourse and larger international enterprises."

Pools or cartels, as already indicated in cables and articles formed one of the dominant subjects of the conference and resulted in quite a divergence of views. The conclusion was that they must be considered as good or bad according to the spirit of their constitution and operation and the attitude of their managers toward the general interest. The field for such agreements, both national and international, is usually limited, so the conference declared, to branches of production already centralized and to products supplied in bulk or recognized grades.

On the subject of pools or cartels, it was the conclusion of the conference that they must be considered as good or bad according to the spirit of their constitution and operation and the attitude of their managers toward the general interest. The field for such agreements, both national and international, is usually limited to branches of production already centralized, and to products supplied in bulk or recognized grades.

Can Reduce Costs

Where applicable they can secure a more methodical organization of production, a reduction in cost by better utilization of equipment, the development on more suitable lines of new plant, a more rational grouping of undertakings, can check economic competition and reduce the evils resulting from fluctuations in industrial activity. By this means they may assure to the workers greater stability of employment, and at the same time by the reduction of costs and selling prices bring advantages to the consumer.

Nevertheless, the resolutions declared, if such agreements encourage monopoly and the use of unsound business methods, they may check technical progress and endanger the legitimate interests of sections of society and particular countries. Consequently such combinations should not lead to artificial rise in prices, which would injure consumers, and should give due consideration to the interests of the workers. They should not restrict the supply of raw materials or basic products to any particular country nor create unequal conditions between the finishing industries of the consuming and producing countries. Nor must they prevent the development in any country of industries which that nation considers indispensable.

On the question of control of pools the conference believed that international control of international pools can not be set up. It recommends, however, that the League of Nations study these international pools, their effects on technical progress, on production, conditions of labor, supply and prices. This information, collected with the aid of the various governments, should be published. Such publicity is an effective means, on the one hand, of securing the support of public opinion for agreements which conduce to the general interest, and, on the other hand, of preventing the growth of abuses.

Incidentally any one interested in pools, whether national or international, would be well repaid by reading the six documents on the subject prepared for the economic conference. They can be secured from the League of Nations document agency, the World Peace Foundation, 40 Mount Vernon St., Boston, Mass.

In this series of articles the term rationalization has been taken to mean all mechanisms for reducing costs of production and, therefore, the consolidation of industries has been included; this broad definition is in accordance with the German acceptance of the term. However, the conference limited it to scientific organization of labor, standardization both of material and of products, simplification of processes, and improvements in the system of transport and marketing.

While obvious to us in America, the conclusions are so important for Europe that they are given here in full:

"The conference considers that one of the principal means of increasing output, improving conditions of labor and reducing costs of production is to be found in the rational organization of production and distribution.

"The conference considers that such rationalization aims simultaneously:

1. At securing the maximum efficiency of labor with the minimum of effort;
2. At facilitating, by a reduction in the variety of patterns (where such variety offers no obvious advantage), the design, manufacture, use and replacement of standardized parts;
3. At avoiding waste of raw materials and power;
4. At simplifying the distribution of goods:
5. At avoiding in distribution unnecessary transport, burdensome financial charges and the useless interposition of middlemen.

"Its judicious and constant application is calculated to secure:

1. To the community greater stability and a higher standard in the conditions of life;
2. To the consumer lower prices and goods more carefully adapted to general requirements;
3. To the various classes of producers higher and steadier remuneration equitably distributed among them.

"It must be applied with the care which is necessary in order, while at the same time continuing the process of rationalization, not to injure the legitimate interests of the workers; and suitable measures should be provided for cases where during the first stage of its realization it may result in loss of employment or more arduous work. It requires, further, so far as regards the organization of labor in the strict sense of the term, the co-operation of employees and the assistance of trade and industrial organizations and of scientific and technical experts.

"The conference accordingly recommends that governments, public institutions, trade and industrial organizations or public opinion as the case may be:

1. Should lead producers to direct their endeavors along the lines indicated above, and, in particular;
   (a) To encourage and promote in every way the investigation and comparison of the most adequate methods and most practical processes of rationalization and of scientific management, and of the economic and social results obtained thereby;
   (b) To apply these endeavors in industry, agriculture, trade and finance, not merely to large but also to medium and small undertakings, and even to individual workers and handicraftsmen, bearing in mind the favorable effects which they may have in household organization and amenities;
   (c) To give special attention to measures of a kind calculated to ensure to the individual the best, the healthiest and the most worthy employment, such as vocational selection, guidance and training, the due allotment of time between work and leisure, methods of remuneration giving the worker a fair share in the increase of output, and generally conditions of work and life favorable to the development and preservation of his personality;
2. Should carry on systematically on an international as well as a national basis the standardization of materials, parts and products of all types which are of international importance, in order to remove the obstacles to production and trade which might arise from a purely national policy of standardization;
3. Should undertake on an international basis investigations for ascertaining the best methods employed and the most conclusive results obtained in every country in the application of the principles set out above utilizing the investigations already made in certain countries and encouraging the exchange of information among those concerned;
4. Should spread in all quarters a clear realization of the advantages and the obligations involved in rationalization and scientific

management as well as of the possibility of their gradual achievement."

With reference to the remaining resolutions, sufficient information has been given in articles already published in this paper to make repetition unnecessary here. The recommendation for adequate international statistics in industry and agriculture will probably be well received in the United States where national statistics, on industry in particular, are now effectively used.

The recommendations on commerce were lengthy, occupying, with xplanations thirteen printed pages of legalcap size. They warrant the careful study of every American interested in foreign trade.

All of the recommendations covered in the committee reports and resolutions were referred at the closing session to the League of Nations for such action as the various items required. At the same time the various international organizations previously referred to will take these matters in hand and co-operate with the various league agencies to secure results.

Two days before the closing of the conference the delegation from Russia, or from the Union of Socialist Soviet Republics, as they call it, demanded that there be a resolution recognizing the co-existence of the two economic systems, their own and that of the rest of the world, threatening otherwise to withdraw from the conference. A compromise was reached through the efforts of Roland W. Boyden, of Boston, representing the International Chamber of Commerce. He introduced a resolution which declared that the conference recognized the importance of the renewal of world trade and that while refusing to infringe upon political questions, regarded the participation of delegates from all the countries present, irrespective of differences in their economic systems, as a happy augury for a pacific commercial co-operation of all nations.

This resolution adopted satisfied the Soviet delegation and they remained in the conference to the end, though they voted against all resolutions that ran counter to their economic system or practice.

Japanese Industry Staggering Under Debt Burdens of Mismanagement

Hope placed in decline of yen

By Our Tokio Correspondent

IN articles which appeared during 1926 this correspondent was pessimistic regarding Japanese business. It was pointed out that most Japanese industries were piling up losses, that the rise of the yen was ruining the export trade. At the present writing, at the end of the most severe financial crisis which the Empire has had since 1896, he still is pessimistic. The remedies applied by the Japanese government have been pain-killers. Amputation was needed. Scores of industries are staggering under debt burdens which, even if other handicaps were lacking, would make profitable competition in foreign fields impossible.

A high yen is fatal to Japan's commerce. This reservation must be kept in mind. If the yen goes up, few industries which depend on an export market will be able to prosper. If the yen goes down and stays down, most of these lines will be comparatively profitable until production costs once more catch up with export prices.

Japan's present troubles began to accumulate in 1920, when the world-wide slump caught the Empire's war-baby industries and threw them flat upon their backs. These industries, built up in the absence of European and American competition during the war years, had paid practically all their earnings in dividends. They had inadequate reserves. Japan has no raw materials worthy of the name except raw silk. It must import iron (although it has some), coal (of which it has more), cotton, wheat, wood pulp, hemp, wool, fertilizers and most of the other commodities on which its larger manufacturers depend. Its domestic market was and is small. This meant high overhead costs. Its experience was limited. This meant waste. Naturally the earnings of these handicapped industries were small.

Dividends, however, continued high. Japan's banks, in many cases, were founded by industrialists and are controlled by them. The industrialist, as a bank, lends to himself as a manufacturer, against the security of stock in his various enterprises. When losses have been chalked up and it seems necessary to pass a dividend, the bank, realizing that the value of the security behind its loans will drop (dividends and not equity are the basis of stock market values here), lends the company money for its dividend. This practice has been common ever since 1920. The results are hidden in the books.

Two factors, the high yen and the wars in China, are hurting Japanese commerce. Last year few lines were able to operate at a profit. One of these was rayon. Several new plants were opened, but these bought practically all their machinery from German makers. Marine products showed a good margin of profit. This is a well-organized industry, efficiently managed and equipped with modern machinery. The cement mills broke a little better than even, although restricting production to sustain prices for most of the year. Shipbuilding, steel, cotton yarn and cloth, silk reeling, leather, flour, superphosphatic fertilizers and dozens of other industries failed to break even. So far this year business has been worse than in 1926.

In March Japan's finances commenced to crumble under the weight of debts which had accumulated since 1920, the year of the great panic. The government's policy had been to postpone deflation, but so intimate had been the connection between banking and industry that the first whisper regarding the condition of the Watanabe Bank caused it to close its doors. Its closure brought down a dozen more before the panic was checked.

Early in April business began to be suspicious of Suzuki & Co., a concern which had piled up immense losses. As it had banked with a semi-official institution, the Bank of Taiwan, bankers had taken for granted that it would not be allowed to fail. On one previous occasion the government had made large loans to the Bank of Taiwan and had done nothing to force Suzuki to liquidate. The Imperial Diet, however, forced the appointment of a commission to readjust the Bank of Taiwan and bankers commenced to call their loans to Suzuki.

Collapse of Banks

This uneasiness was communicated to the Bank of Taiwan and banks began to call their loans. The government proposed to guarantee unsecured advances by the Bank of Japan to the Bank of Taiwan up to a limit of 200 million yen. The Privy Council refused to sanction this, the government resigned and the Bank of Taiwan closed all its branches, with the exception of those in Formosa. Runs commenced all over the country on the following day, April 18, and bank after bank went down, including the great Fifteenth Bank of Tokyo and the Omi Bank of Osaka. By April 21 the situation was out of hand. The Bank of Japan had advanced hundreds of millions of yen in emergency loans but the runs could not be stopped by a show of cash. The authorities decided to call a special session of the Diet.

The effects of the moratorium have been many. Spinners and weavers, unable to procure financing, have been obliged, in many cases, to shut down their plants entirely. The cement mills have done the same. Goods are piling up in the producing centers and prices there are falling, while in the country and smaller towns stocks are short and prices are rising. There is no doubt that when the moratorium ends retail trade will boom for a time.

The Imperial Diet has passed three bills. One sanctions the Imperial ordinance declaring the moratorium, ex post facto. The second lets down the bars on advances by the Bank of Japan and provides government indemnity for its losses up to 500 million yen on these emergency advances. The third provides that the Bank of Japan may lend without limit to the Bank of Taiwan, if necessary without security, and that the government shall indemnify the Bank of Japan for its losses in this connection up to 200 million yen. These measures became law on May 9.

While the government policy is to delay deflation as long as possible and to let the country at large—that is, the taxpayers—carry the burden of industrial mismanagement and experiments, there seems no doubt that Japan is in for a period of liquidation.

Business, of course, will go on as usual, but there will be no boom in machinery for new industries now.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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THE disposition of most men to attribute what they cannot understand to an anthropomorphic being is especially noticeable on the great Exchanges where the reaction of the collective mind to current developments finds expression in the prices asked and paid.

As this is a rather "highbrow" statement it may be well to explain that an anthropomorphic being is a supernatural person to whom human attributes are ascribed.

In the stock market and other places where the composite opinion of those interested is registered by the prices at which securities or commodities change hands, it is the habit to use the word "They" to describe the anthropomorphic being by whose benevolence or malevolence values are lifted or depressed. "They" are selling, or "They" are buying, are phrases often used by mortals who ignorantly or thoughtlessly assume that there is some "deus ex machina" or "god of the machine" by whose omnipotence the operation of economic law is directed and can be suspended or accelerated.

When asked to be more specific those who use the word "They" in this sense usually answer that it means the "powers that be" or some super-group of capitalists or speculators who act in concert and hold the destinies of the market in the hollows of their hands.

With human nature as it is, the existence or formation of such a group is of course impossible, but the anthropomorphic illusion by which it is prefigured persists nevertheless, and it is generally more vivid when prices are declining than when they are advancing.

Hence, "they are selling" is the explanation usually offered for a falling market, while a rise is often attributed to the beneficent buying of some particular individual. This was particularly true of last week's stock market. After an upward movement that had been almost without precedent security prices have commenced to yield slightly, and the easier tendency is generally ascribed to the selling of an unnamed but powerful faction that is variously described as "they" or "the bears." Now as a matter of fact there has been very little bear selling and the securities sold are those that have been carried by successful and circumspect bulls who are commencing to think that prudence may be the better part of valor.

Among the considerations upon which they may have acted are the following: Car loadings and railroad earnings that are below last year. Decreased bank clearings in most cities other than New York. Stock brokers' loans that are within $80,000,000 of the high record of January, 1926. The announcement (since disavowed) that an extra session of Congress will be called for early in October. Mercantile failures numbering 10,403 with liabilities of $247,000,000 during the first five months of 1927, as against 9,768 with liabilities of $180,000,000 in the corresponding period a year ago. A report in Dun's Review which shows that the new building permits issued in May contemplate an expenditure that is 13.8 per cent under last year. The largest crude oil production on record during the week ending June 4, with a corresponding increase in an oversupply that was already burdensome. A continued slackening of activity in the steel industry, where the *Iron Trade Review* says that "a greatly intensified competition is sapping the strength of the price situation." An increase in the per capita cost of government in the United States, which is put at $96 in 1925 as against $30 in 1913, and a reduction in the expected yields of cotton, wheat, corn and other grains that will leave the railroads with less freight to haul although it has already advanced prices.

None of these developments indicate a serious maladjustment, but taken together they disclose a reactionary tendency that is becoming more inclusive day by day, and it is not surprising that it has spread to the stock market, where the liquidation of the sagacious rather than the malevolence of the anonymous "they" has somewhat lowered the average of values.

But it would not be fair to say that all the news is reactionary, for we read that 25 banks in Florida have resumed payment since August, 1926, and that there is a gratifying improvement in the shoe industry, where the production for the first four months of 1927 has reached a total of 111,000,000 pairs as against 106,000,000 pairs in 1926.

In the markets for commodities that are traded in for future delivery the story is somewhat different. Cotton is up again, while wheat and corn are fluctuating feverishly. Corn in particular has reached a price that has made it practicable to import some small cargoes from the Argentine despite the duty of 15 cents a bushel.

It is in fact difficult to write seriously of a situation in which the imagination is such an important factor, and about all that can be said of cotton is that in the summer time all things are possible.

Meantime the cotton goods market is marking time and business is restricted by the excitement in futures. Of all the staple commodities, sugar is the only one that is now selling at or below the cost of production, and at the price of $2.60 at which sugar for delivery in March, 1928, is selling, it seems to be cheap.

WHAT'S DOING IN INDUSTRY

THERE is no change in the general condition of the machinery and machine tool trade. Here and there throughout the country improvements are noted, but in many industrial centers there is a slowing up of sales activity.

NEW YORK offers a good example of this latter condition, but some recent inquiries offer encouragement for the future. New England notes an improved demand, especially for textile and special production machinery. The machine tool trade in Canada is in a better position due to the many large industrial projects that are getting under way. In the South the floods have had their effect on general conditions, but there is an improvement in the demand for certain types of machinery.

DETROIT reports a continuation of dull conditions, many of the automobile plants running below normal with little business from them in prospect. An improvement is noted in Indianapolis in the past two weeks, woodworking and textile plants furnishing the stimulus. Sales of single tools in Cincinnati make a fairly satisfactory total. Inquiries are more active in Chicago, but orders are still below normal.

DEVELOPMENTS in general business do not indicate any serious maladjustment, but they do disclose a reactionary tendency that is becoming more inclusive day by day.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

Inactivity bordering on dullness continues in this market. Sales are reported to be spasmodic, only scattered orders for special replacement tools being placed at this time. Inquiries, however, are more numerous and lend an air of encouragement to the future. One large inquiry calling for some forty tools is in the hands of local dealers and is looked upon as a sign of the opening up of business.

Steel fabricating plants are the best buyers now, and the large amount of construction work is providing a fair market for certain types of machinery used by contractors. Also, aircraft manufacturers are seeking equipment, this business being stimulated no doubt by the recent transoceanic air feats. Marine engineers are inquiring for a few tools.

Orders placed in the past week include power presses, brakes, large engine lathes, milling machines, radial drills and a variety of toolroom equipment. June volume is expected to be better than that of May.

SOUTHERN DISTRICT

Though general conditions in this district are somewhat unsatisfactory, due to the effects of the floods, distributors state that they have noted some improvement in the demand for machinery and tools, with sales at present comparing favorably with the corresponding period last year.

Lack of construction activity outside the larger cities is causing a lesser demand than usual for contractors' machinery and equipment, and even though sales may show considerable improvement during the rest of June it is certain that business on this line for the first six months of 1927 will fall quite a bit below the same period in 1926. It is interesting to note, however, that road building equipment is about equally as good as last season, and that the larger amount of road work in progress in the Southeast this year gives promise this business will continue as good as last year during the spring and summer period.

Textile mill sales are fairly brisk because of the large number of new cotton plants being constructed in this district. Woodworking and furniture making machinery, however, has declined, and does not promise early improvement. Brick-making equipment has been off ever since the first of the year. Smaller shops and service stations and garages are placing a few orders, mainly for rebuilt machinery.

CINCINNATI

Improvement in the general business tone in the past week is reported by machine tool manufacturers in the Cincinnati district. The majority report a greater volume of sales than in the preceding week and none report a falling off. Selling agents report that the demand in the city and adjacent territory is increasing in an encouraging way.

The bulk of the week's business was made up of purchases of single tools and replacements, made by general machinists and miscellaneous users. The orders came from practically all sections of the country and the sales were well diversified as to sizes and types of tools.

A slightly increased amount of buying was done by concerns in the automotive field. Railroads did some scattered buying of single tools, a few were bought by oil producers, and some by concerns in the electrical industry. There were also reported a few small orders for export.

Manufacturers report the receipt of an increased number of inquiries. These, it is stated, indicate that for a time at least the backbone of the market will be single tools and replacements, but a growth of sales totals is confidently expected.

INDIANAPOLIS

The trade is not overly enthused concerning the volume of machinery and machine tool trade here. An improvement has been shown during the past two weeks in spite of adverse weather conditions. The volume thus far this year compares favorably with that of the same period last year.

Tool demand from the automobile industry continues good. Production in the Indiana factories is being held up well and demand for special woodworking machinery from the body plants is very good, these plants experiencing one of the best years in their history.

A good demand also is coming from the textile mills in the state, one of the biggest single orders coming recently from a hosiery mill in Indianapolis, calling for $1,500,000 worth of special machinery for the manufacture of silk hose. Manufacturers of automobile accessories, particularly ignition systems and shock absorbers, are steady buyers of machine tools and special machinery.

In view of the coal strike, a surprise situation has developed in a sudden demand for special coal mine machinery. Many Indiana mines have signed separate contracts with the miners and are resuming.

DETROIT

This is a period of dullness for Detroit and the whole of Michigan. While there is no very great feeling of pessimism, the general business tone is low and there seems little promise that it will improve soon.

With the exception of one large order placed last week, there have been almost no deals of any significance. This one order is still veiled in secrecy but the information thus far advanced indicates that it is not for local use.

Many of the automobile plants are running below capacity. The shut down of the Ford plants in preparation for the new car has influenced the general depression. Machinery dealers are awaiting the advent of the much discussed car.

The General Motors plants are doing fairly well but there is no buying being done and apparently no changes are being contemplated. There are a few fairly large replacement orders and the usual run of occasional business, but the market as a whole is not nearly as good as it was expected to be a few weeks ago.

CANADA

While some slackening in demand has been noted during the last couple of weeks, metal working plants in Canada find themselves in a much better position than at this time last year. Many industrial projects are under way and are furnishing an excellent market for machinery and machine tool dealers. Considerable enlargement of machine shop and other facilities by Yarrows, Ltd., Victoria, B. C., has been found necessary by increasing shipbuilding and repairing business. At Belleville, Ontario, an unused engineering plant has been taken over by Stephens-Adamson Co., of Aurora, Ill., and conveying equipment will be produced. In Toronto, foundries, machine shops and the larger engineering plants are busy. The city itself is in the market for machine tools.

There are many expansions in prospect in the pulp and paper industry, which will ultimately mean new business for a number of engineering plants. It is anticipated that the Dominion Engineering Co. will benefit by orders for turbines from the new Montreal Island Power Co.'s 65,000-hp. development.

Two new turntables are being erected at Halifax at a cost of $100,000. A new freight and immigration station at the same terminal will cost about $300,000. The outlook for the Algoma Steel Corporation has improved owing to rail orders.

CHICAGO

More inquiries are reported by manufacturers and dealers during the last week. A more encouraging aspect prevails in the machine tool industry. Actual business, however, as based on sales recorded, shows little change from the condition which has characterized the market for several weeks. Many machinery concerns are arranging for the annual vacations and a number of executives have already closed their desks and left the city.

From present indications, as gathered from several sources, the outlook for an improved market in machine tools contemplates a more or less inactive condition for the next two months, no decided change being expected until after the vacation period. Such railroads as have issued lists are closing on outstanding items, and no new ones are reported to be forthcoming for the present. Demand for used tools is sluggish and spotty. The Chicago Board of Education is inquiring for a few tools. Representatives of wood-working machinery plants report demand as somewhat more active since the settlement of the recent strike by members of interior finish labor unions.

NEW ENGLAND

Improvement in the textile industry during the past twelve months has created a demand for machinery and New England manufacturers of this equipment report a satisfactory volume of business and indications of continued activity. The New England requirements, which have lagged to a considerable extent, are brightening. The business is of replacement variety, while from the South orders for new equipment are being received.

General demands for production machinery for metal industries are fairly well maintained. Export business is reported satisfactory. Most of the shipments are going to Japan and South America. Single unit orders dominate, especially for domestic deliveries.

The Aircraft Corporation of America has acquired a tract of 127 acres in the town of Milford, Conn., and plans the erection of a plant for the building of land planes and seaplanes in the near future.

Foundrymen Meet at Chicago

Technical and business sessions were the features of the thirty-first meeting of the American Foundryman's Association, held in Chicago, June 6 to 10. Twenty-two papers and reports from five committees were received. The fact that there was no exhibit this year provided an opportunity to devote more time to other activities.

The following officers were elected for the ensuing year: President, S. W. Utley, vice-president and general manager, the Detroit Steel Castings Co.; vice-president, S. T. Johnston, vice-president of the S. Obermayer Co., Chicago. The directors elected for a term of three years are: E. H. Ballard, general foundry and pattern shop superintendent of the General Electric Co., West Lynn, Mass.; H. Y. Carson, research engineer of the American Cast Iron Pipe Co., Birmingham, Ala.; W. D. Goldsmith, treasurer of the C. A. Goldsmith Co., Newark, N. J.; A. E. Hageboeck, secretary-treasurer of the Frank Foundries Corporation, Moline, Ill.; and W. J. Nugent, president of the Nugent Steel Castings Co., Chicago.

Acting upon the recommendation of the board of awards, Major Robert Alexander Bull was awarded the Joseph S. Seaman gold medal of the American Foundrymen's Association in recognition of his services to the association and to the foundry industry.

Entertainment included a complimentary dinner and party held on Tuesday, the annual subscription banquet held on Wednesday, a cruise on Lake Michigan on Thursday, and a golf tournament on Friday. Organized plant visitations were made to various malleable, steel, gray-iron and nonferrous foundries, located in the Chicago district. Philadelphia has been selected as the meeting place for next year's convention.

Boston Edison Wins Coffin Award

The Edison Electric Illuminating Co., of Boston, in competition with public utility companies of the country, has been awarded the Charles A. Coffin Foundation gold medal for 1926, it was announced at the annual convention of the National Electric Light Association in Atlantic City. R. F. Pack, president of the association, in making the award, spoke of the outstanding achievements of the Boston company. This was the fourth annual award of the medal, made possible through the creation of the Charles A. Coffin Foundation by the General Electric Co.

Business Demands Lower Corporation Tax

A specific demand for the reduction of the corporation income tax, backed by the business interests represented in the 1,500 member organizations of the Chamber of Commerce of the United States, will be made upon the new Congress when it assembles next December. This move was decided upon at a meeting of the special committee on taxation, meeting in Washington.

A reduction of the corporation income tax rate to 10 per cent from the 13½ per cent rate now in force will constitute the main item on the business program for tax revision. Such a reduction, it was asserted, should be made even if it were to involve a deficit at the end of the fiscal year, on the ground that the imposition of so heavy a burden upon productive enterprise is wrong in principle and retards the economic development of the country.

Cost of Government

The total cost of government in the United States, covering the aggregate expenditures of federal, state and local governmental authorities and inclusive of capital outlays and debt retirements, amounted to $11,124,000,000 for the fiscal year 1925, as against $10,983,000,000 in 1924 and $2,919,000,000 in 1913, according to a study just completed by the National Industrial Conference Board.

Harvard Dedicates New Business School

In the presence of a great throng of distinguished visitors, the new buildings of the Harvard Graduate School of Business Administration were dedicated at Boston on June 4 with addresses by Owen D. Young, former Dean Edwin F. Gay, Dean Wallace B. Donham and others. George F. Baker of New York, donor of the group of new buildings designed to house the activities of this school of economics, finance and commerce, presented the keys to President Lowell of Harvard University and added another million dollars to the five millions already given by him to the institution.

In his address Mr. Young outlined the evolution of trade from primeval days, discussed the increasing trend toward high ethical practices in modern business, emphasized the rise of the trade association as a factor in creating sentiment, and dwelt upon the growing importance of investment sharing by labor in the enterprises in whose responsibilities it is increasingly concerned. The part such an institution as the Harvard school may play in economic problem research and in training men for business as a profession was comprehensively outlined.

Heat Engineering Course at Carnegie Tech

A new course in heat engineering planned to meet an increasing demand for engineers trained in conservation of fuel is to be offered at the Carnegie Institute of Technology next year. The new course, it is announced, will be offered as an option in the Department of Mechanical Engineering and will be conducted under the direction of Professor W. Trinks, who is a national authority on furnace, combustion, and fuel technology problems.

Steel Treaters Organize Thirty-Fifth Chapter

The thirty-fifth chapter of the American Society for Steel Treating and the fifth to be organized during the administration of President J. Fletcher Harper, was organized in the Canton-Massillon district on May 26. A number of preliminary meetings had taken place previous to this meeting, so that 150 members and guests had dinner at the Canton Club.

President Harper presented a charter to the new group while the principal address of the evening was given by Dr. Zay Jeffries on the subject "Metals of Industry." Dr. Jeffries presented a survey of the metallurgical problems embracing various manufacturing industries, pointing out in particular the metallurgical problems of the lamp industry and those involved in the development of the airplane used by Col. Lindbergh.

Past-president W. S. Bidle, and secretary W. H. Eisenman also addressed the meeting.

The Canton-Massillon Chapter established a new record by having a total membership of 121 on the night of its opening meeting. The following officers of the chapter were elected: Chairman, Martin H. Schmid, Central Alloy Steel Corporation, Massillon; vice-chairman, Earl W. Hanna, American Sheet and Tin Plate Co., Canton; secretary-treasurer, Robert Sergeson, Central Alloy Steel Corporation, Canton. The executive committee comprises: E. C. Smith, Central Alloy Steel Corporation, Canton; Floyd Dore, American Steel Foundries, Alliance; L. D. Gable, Timken Roller Bearing Co., Canton; T. W. Hardy, Timken Roller Bearing Co., Canton; C. E. Nordfeld, Massillon Steel Castings Co., Massillon; D. D. Reed, E. F. Houghton & Co., Canton; Paul M. Snyder and W. M. Lindsey, Central Alloy Steel Corporation, Massillon.

Will Finance Russian Purchases Here

Fox Brothers International Corporation, a subsidiary of the exporting firm of Fox Bros. & Co., Inc., of 126 Lafayette St., New York, announces that it has made arrangements with banking interests in New York and London which will insure a credit against acceptance documents on Russian purchases to the amount of $5,000,000 for the current year. Under this arrangement American exporters will be paid in cash for Russian purchases.

It is stated that the corporation was formed to facilitate purchases of engineering equipment and other things of which the Soviet government is in urgent need in the American market. Under existing economic and industrial conditions the Russian government cannot pay cash for its requirements, and American manufacturers do not feel warranted in extending the long-term credits that are necessary. It is said that there is a strong sentiment in Russia for goods of American manufacture, especially in lines of mechanical equipment.

Personals

GEORGE L. ERWIN, sales manager of the Kearney & Trecker Corporation, of Milwaukee, returned from Europe on June 10.

CLARENCE H. BEACH, of Indianapolis, has been elected chairman of the Indianapolis chapter of the American Society for Steel Treating.

EDGAR E. MILLS, traffic manager of Fairbanks-Morse & Co., of Indianapolis, was recently elected first vice-president of the Indianapolis Traffic Club.

S. H. BLAKE has been appointed chairman of the standardization committee of the General Electric Co., succeeding A. H. Moore, who will retire from active business on August first.

CHARLES BLUM and EMILE TRAMARD, of the Latil Co., of Paris, sailed for France on June 3, after spending two months inspecting American automobile plants.

S. M. RAYMOND, of the Diamond Chain Manufacturing Co., has been elected vice-president of the Purchasing Agents' Association of Indianapolis.

C. A. VESSOT, formerly demonstrator in mechanical engineering at McGill University, Montreal, has been appointed works manager of J. S. Fry & Sons (Canada) Ltd.

SIR CHARLES WRIGHT, of London, England, chairman of Baldwins Ltd., is visiting in Canada. He will sail for England on June 22.

JOHN LYLE HARRINGTON, of Kansas City, Mo., former president of the American Society of Mechanical Engineers, has been elected a member of the board of directors of Robert College, Constantinople.

E. E. CASWELL, who has represented the Union Twist Drill Co., in central New York state for several years, has been appointed manager of the Chicago store of that company, located at 11 S. Clinton Street.

FRANK B. CALDWELL has been appointed sales manager of the Link-Belt Co., of Chicago. He will be located at the Chicago plant office and will have supervision over all sales activities in the Western division.

JOHN P. GREGG, private secretary to Secretary Hoover, has resigned to become manager of the International Chamber of Commerce. He will attend the forthcoming general conference of that organization at Stockholm.

H. A. GILLILAND, general foreman of the mining drill department of the Canadian Ingersoll Rand Co., Sherbrooke, Quebec, has been appointed superintendent of the Elmira Machinery and Transmission Co., Elmira, Ontario.

GEORGE M. GALT has been appointed eastern sales representative of the Avey Drilling Machine Co., Cincinnati, Ohio. He will act as direct factory representative, working with Henry Prentiss & Co. in their territory.

R. P. SHIMMIN has been appointed assistant to the chairman and the president of the Link-Belt Co., of Chicago. He will make his headquarters at the executive offices of the company at 910 Michigan Ave., Chicago.

W. L. SCHOONMAKER has been appointed sales manager of the Kent Co., Inc., of Rome, N. Y., makers of waxing, polishing and scrubbing machines. Prior to this appointment, Mr. Schoonmaker was affiliated with the International General Electric Co., in charge of export sales of motor-driven household appliances.

Forty-seven representatives of the Rockwood Paper Pulley Stores, Inc., were guests in Indianapolis, on May 29, 30 and 31, at a sales convention held by the Rockwood Manufacturing Co. These stores comprise the national distribution system for Rockwood pulleys, and include electrical and mill supply jobbers in the larger cities from coast to coast.

PRESIDENT COOLIDGE has approved the recommendation of the Secretary of War for the appointment of Brigadier General James E. Fechet, now Assistant to the Chief of Air Corps, to be Chief of Air Corps with the rank of Major General, upon the retirement of Major General Mason M. Patrick, present chief of Air Corps. General Patrick reaches on Dec. 13, 1927, the age of statutory retirement—64 years.

Obituaries

FRANK N. BRAYER, president and general manager of the Co-operative Foundry Co., at Rochester, N. Y., died at his home in that city on June 2. He was 72 years old and had been active in business until the time of his death. He was a charter member of the American Foundrymen's Association.

WALTER BANGS, a member of the iron and steel firm of Chapin & Bangs, Bridgeport, Conn., died June 9 at his home in that city. Mr. Bangs was 60 years old and a native of Dennis, Mass. He first started in the hardware business with Condon & Carter in Providence. This firm later moved to Bridgeport and soon changed its name to Carpenter & Bangs, when these men bought out the business. The firm was incorporated and its name changed to the present form when Murray H. Chapin joined the company.

Business Items

Articles of incorporation have been filed with the secretary of state in Indianapolis by the Griffith Steel Corporation, of Griffith, Ind. The incorporators are J. W. Taylor, W. J. Harvey and F. Y. Keator.

E. C. Atkins & Co., of Indianapolis, Ind., have issued the first quarterly number of their "Saw Kerf," a magazine devoted to the description and uses of various types of saws.

The Eureka Foundry Co., 406 S. 68th St., Gadsden, Ala., has announced the erection of a new foundry and machine shop. The new plant will be devoted to the production of both brass and iron, having an initial daily capacity of about five tons.

The Bassick Co., Bridgeport, Conn., has recently acquired the Foster-Merriam Co., Meriden, Conn., manufacturers of casters. H. O. King, vice-president and general manager of the Bassick Co., announces the intention of the company to transfer similar lines to the Meriden plant.

Articles of incorporation have been filed with the secretary of state in Indianapolis by the Utility-Strate Manufacturing Co., of Fort Wayne, Ind. The corporation is formed for the manufacture of tools, machines and equipment. The incorporators are Robert J. Jauch, Guy Colerick and Leon J. Baker.

Articles of incorporation have been filed with the secretary of state by the Challenge Gauge and Tool Co., 560 North Elder St., Indianapolis. The company has a capital stock of 240 shares of no par value common stock and will manufacture machinery and machine parts. The incorporators are Carl F. Millican, James P. Stephens and Thomas Fitzwater.

Articles of incorporation have been filed with the secretary of state in Indianapolis by the Evansville Malleable Casting Co., of Evansville, Ind. The corporation is formed to buy and manufacture iron and other metals. The incorporators are Daniel Wertz, Elmer D. Luhring, John L. Igleheart, Hilary E. Bacon and Gitner Igleheart.

The first meeting of the executives in Montreal, of the new Canadian section of the American Welding Society was held recently. Affiliations with Montreal engineering organizations were discussed and it was decided to hold joint meetings once or twice a year with the Engineering Institute of Canada, the American Welding Society to supply the speaker.

The Moore Drop Forge Manufacturing Co., Springfield, Mass., has acquired authority to manufacture and sell the products of the Anthracite Chain & Engineering Co. of Hazleton, Pa., under the name of Morco Patented Two-Part Conveyor Chain. The department will be in charge of S. J. Benner, formerly president of the Anthracite company. He will assume his new duties July first.

Officials of the Kokomo Steel and Wire Co., Kokomo, Ind., have authorized the announcement that the required number of stockholders of the three companies that are being merged into the Continental Steel Co., have filed their approval of the consolidation. The other two companies are the Superior Sheet Steel Co., of Canton, and the Chapman-Price Steel Co., of Indianapolis. The three will operate as one corporation.

Build R.R. Shops in Central America

The International Railways of Central America have added new equipment consisting of twenty-five coaches, with steel trucks and bodies, and 125 freight cars, according to the Department of Commerce. The company is also constructing a new repair shop in Guatemala City, which when completed, will cover 40,000 sq.ft. All bridges on the Atlantic division of the road are being either reconstructed or reinforced. It is stated that when completed they will be 100 per cent stronger than at present, and this, with the heavier rails recently laid, will greatly add to the efficiency of the railway. Undoubtedly, Puerto Barrios, the Atlantic terminus of the line, will be the logical outlet for Guatemalan, Salvadorean and Honduran coffee, by way of Chiquimula, Zacapa, Santa Ana branches.

Forthcoming Meetings

American Society for Testing Materials. Annual meeting at French Lick, Ind., June 20 to 24. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia.

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Machine Tool Builders' Exposition. First annual machine tool exposition, conducted by the National Machine Tool Builders' Association, at the West Annex of the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, chairman of the exposition committee. Roberts Everett, manager of the exposition, 225 West 34th St., New York. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Building, Cincinnati, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

PIG IRON, the starting point of price movements in finished steel, is experiencing slowness of demand, with buying confined to small lots. The principal hot-rolled steel items, also bolts, nuts, rivets and scrap, are notably weaker than a month ago. Steel output continues heavy despite the apparently seasonal slowing-down in demand. Reinforcing bars, sheets, strips and wire appear more active than any of the other steel materials. All price advances of the week were in non-ferrous products, principal among which were solder, highest grade babbitt metal, furnace coke, scrap lead (heavy) and old brass (light). Fabricated brass and copper, and zinc sheets are lower in the West. Bars, shapes and plates, base, Pittsburgh, continue under the quotation of $1.90 per 100 lb.; as low as $1.70, however, is reported on shapes, $1.75 for plates, and $1.80 on soft steel bars.

(All prices as of June 10)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.19
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	27 17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	23.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.25	3.50	3.25	3.89
No. 12	2.30	3.55	3.30	3.94
No. 14	2.35	3.60	3.35	3.99
No. 16	2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.70@2.80	3.75	3.75	4.00
No. 22	2.85@2.95	3.90	3.90	4.15
No. 24	2.90@3.00	3.95	3.95	4.20
No. 26	3.00@3.10	4.05	4.05	4.30
No. 28	3.15@3.25	4.20	4.20	4.45
Galvanized				
No. 10	3.05@3.15	4.10	3.95	4.25
Nos. 12 to 14	3.15@3.25	4.20	4.05	4.35
No. 16	3.25@3.35	4.30	4.15	4.45
No. 18	3.40@3.50	4.45	4.30	4.60
No. 20	3.55@3.65	4.60	4.45	4.75
No. 22	3.60@3.70	4.65	4.50	4.80
No. 24	3.75@3.85	4.80	4.65	4.95
No. 26	3.95@4.05	5.05	4.90	5.20
No. 28	4.20@4.30	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ⅛	¼	⅜	½	1	1½	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛", 8.35c.; ¼, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, ⅛@¼-in. thick.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic, up to carlots, New York			14.00
Tin, pigs, 5-ton lots, New York			69.75
Lead, pigs, up to carlots, E. St. Louis	6.17½	New York	7.00
Zinc, slabs, up to carlots, E. St. Louis	6.27½	New York	7.25

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	15.50	....	15.00
Copper sheets, base	21.50	21.50	21.50
Copper wire, base	18.25	18.25	14.75
Copper bars, base	21.12½	21.25	21.12½
Copper tubing, base	23.50	24.25	23.50
Brass sheets, high, base	17.75	17.75	17.75
Brass tubing, high, base	22.62½	22.62½	22.62½
Brass rods, high, base	15.50	15.62½	15.50
Brass wire, high, base	18.25	18.25	18.25

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26.02
Zinc sheets (casks)	11 00	11 30	10 11
Solder (½ and ½), (case lots)	41.00	42.00	38½@42½

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	86.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	13.00

Nickel, f.o.b. refinery, cents per lb.:
Ingots..... 35.00 Electrolytic.. 39.00 Shot.....36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11 00 @11.25	10.50	9.75@10.25
Copper, heavy, and wire	10 25 @10.75	10 50	9.00@ 9.50
Copper, light, and bottoms	9 00 @ 9.50	9.00	8.00@ 8 50
Heavy lead	5 12½@ 5 37½	5.25	4.50@ 5.00
Tea lead	4 00 @ 4.25	3.25	3 00@ 3.50
Brass, heavy, yellow	7 00 @ 7.25	6.75	6.50@ 7.00
Brass, heavy, red	8 75 @ 9.00	9.25	8.50@ 9.00
Brass, light	5.00 @ 5.50	6.00	5.50@ 6.00
No. 1 yellow rod turnings	7.25 @ 7 50	7.00	6.50@ 7.00
Zinc	3.75 @ 4 00	3.00	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9 50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0. 10@0. 13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½	36 00 per M	.15
Sal soda, per lb	02½	02	.02¾
Roll sulphur, per lb	.02¾	03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	89½	99	.90
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.33	35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.155	.1587½	.1662½
Solder (½ and ½)	per lb.	.41	.4125	.3675
Cotton waste, white	per lb.	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3 10	3.10	3.55
Lard cutting oil	per gal.	65	.55	.55
Machine oil	per gal.	33	33	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9 15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1 29	1.27	1.32
Cloth	3 10	3.05	3.05
Fire clay, per 100 lb. bag		.75	75
Coke, prompt furnace, per net ton		Connellsville,	2.85@3.00
Coke, prompt foundry, per net ton		Connellsville,	4 00@4 50
White lead, dry or in oil,	100 lb. kegs	New York,	15.25
Red lead, dry,	100 lb. kegs	New York,	15.25
Red lead, in oil,	100 lb. kegs	New York,	16.75

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in	50%	50–10%
Larger up to 1 x 30-in	45%	50%
1¼ and 1½ in. dia	30%	35%
Carriage bolts:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Coach and lag screws:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Tap bolts, hexagonal heads	45%	
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	
Case hardened, hexagonal, tapped, in packages	30%	
Washers: Deduct from list, per 100 lb.	$1.50	$3.50
Rivets, button and cone head:		
Small, including $\frac{7}{16}$-in. dia		50–10%
Large (base) per 100 lb	$6.50	$5.00

EXTRA per 100 lb. on rivets, for ¼-in. dia., 35c.; ⅜-in., 15c.; 1-in., 5c.; length 1-in. and shorter, 25c.; longer than 1-in. up to and including 1¼-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Calif., Fresno—County, D. M. Barnwell, Clk.—equipment for machine shop to replace fire loss. Estimated cost $50,000.

Ind., Anderson—American Steel & Wire Co., H. O'Connor, Supt.—machinery and equipment for the manufacture of electric welded fabric rods for proposed 2 story, 170 x 300 and 200 x 300 ft. plant. Estimated cost $100,000.

Mass., Cambridge (Boston P. O.)—W. P. Collins, 53 State St., Boston—miscellaneous tools and equipment for proposed 2 story repair and service garage here. Estimated cost $50,000.

Mass., Wellesley (Boston P. O.)—Wellesley Colonial Garage Inc., Linden and Central Sts.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $50,000.

Mass., Woburn—Winn St. Motor Mart Co., Winn St.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $40,000.

Mich., Detroit — Dept. of Purchases & Supplies, 710 Marquette Bldg., J. E. Mills, Comr., will receive bids until June 18 for two lathes, one shaper, one radial drill and one drill press.

Neb., Fremont — City will soon receive bids for a 20 ton traveling crane.

O., Kent—Bd. of Trustees, Kent State Normal School, J. B. Gillespie, Jr., Bus. Mgr.—metal and woodworking equipment including two 24 in. lathes, cut-off and rip saws, planers, automatic woodworking machines, etc. for proposed new training school.

Ont., Goderich—J. E. Baechler—prices and catalogs on complete equipment for the manufacture of wood specialties for proposed plant. Estimated cost $50,000.

Ont., Nestorville—J. McFadden, prices and catalogs on new equipment for sawmill to replace fire loss. Estimated cost $250,000.

Ont., Parry Sound—Parry Sound Wood Turning Co.—machinery and equipment, to cost $3,000.

Que., Montreal—Montreal Tramway Co. —forge, complete, etc.

Opportunities for Future Business

Calif., Los Angeles — Harvey Machine Co., 1333 South Los Angeles St., has acquired a site and plans the construction of a machine shop at Alameda and Randolph Sts.

Calif., Los Angeles—Los Angeles Pipe & Supply Co., plans the construction of a group of factory buildings in Laguna-Maywood Industrial Dist. Estimated cost $200,000.

Calif., Santa Monica—Pratt Furniture Co., 1431 3rd St., awarded contract for the construction of a 3 story, 70 x 108 ft. factory. Estimated cost $63,675. Noted May 26.

Calif., Santa Rosa — Santa Rosa High School Dist., plans the construction of a machine shop, woodworking shop, etc. Estimated cost to exceed $25,000.

Conn., Milford—Aircraft Corp. of America, J. H. Stelling, Pres., manufacturers of airplanes, is having plans prepared for the construction of a 1 story, 150 x 350 ft. plant at Laurel Beach Rd. Estimated cost $150,000. Private plans.

Ga., Hopeville — Evans-Neman Lumber Co., Chicago, Ill., plans to rebuild lumber mill recenlty destroyed by fire, here. Loss is estimated at $125,000. Private plans.

Ga., Savannah—W. W. Smith, Blakely, plans the construction of a lumber mill, planing mill, etc., here. Private plans.

Ill., Chicago — Grinnell Co., Inc., 208 South La Salle St., awarded contract for the construction of a 1 and 2 story, 176 x 275 ft. warehouse and pipe shop, etc., at 4409-4433 South Western Ave. Estimated cost $300,000.

Ill., East Peoria — Caterpillar Tractor Co. awarded contract for the construction of a 1 story garage on West Washington St.

Ill., Mount Carmel—A. R. Hanley, is having preliminary plans prepared for the construction of a 3 story garage, etc. at Sixth and Market Sts. Estimated cost $200,000. Berger & Kelley, Lincoln Bldg., Champaign, Archts.

Ill., Rockford—Hanson Clock Co., 1120 Eleventh St., awarded contract for the construction of a 2 story, 50 x 140 ft. addition to factory. Estimated cost $40,000.

Ia., Davenport — Davenport Drop Forge Co., 510 South Howell St., plans the construction of a 1 story, 32 x 40 ft. forge shop.

Ia., Dubuque—Maizewood Products Corp., H. Brennan, Pres., 209 South State St., Chicago, Ill., is having preliminary plans prepared for the construction of a 1 story, 60 x 450 ft. wall board factory. Estimated cost $100,000.

Mass., Arlington (Boston P. O.)—Bd. of Public Works, is receiving bids for the construction of a 1 story, 70 x 140 ft. garage and repair shop at Hobbs Ct. E. T. Nolte, 120 Monatiquot Ave., Braintree, Archt.

Mass., Ashland—Warren Telechron Co., awarded contract for the construction of a 1 story factory on Holmes Ave.

Mass., Cambridge (Boston P. O.)—W. P. Collins, c/o I. Stone, 53 State St., Boston, awarded contract for the construction of a 2 story repair and service garage at 667 Cambridge St. here. Estimated cost $50,000. Noted June 9.

Mass., Dorchester (Boston P. O.)—H. E. Cline, 43 Tremont St., Boston, awarded contract for the construction of a 1 story repair and service garage on Columbia Rd. here. Estimated cost $75,000. Noted Mar. 10.

Mass., Lynn—H. Weinstein, 18 Whittier St., will build a 1 story repair and service garage. Estimated cost $50,000. E. Earp, 333 Union St., Archt.

Mass., South Boston (Boston P. O.)—R. S. Brine Transportation Co., 43 India St., Boston, is receiving bids for the construction of a 1 story garage and repair shop at 194 West First St., here. E. C. Luce Jr., 14 Beacon St., Boston, Archt.

Mass., Worcester — Worcester Consolidated St. R.R. Co., H. R. Whitney, awarded contract for the construction of a garage and repair shop on Grove St. Estimated cost $40,000.

Mich., Detroit—First National Bank, Woodward St. and Cadillac Sq., will receive bids until June 20 for the construction of a 19 story garage on Congress St. A. Kahn, 1000 Marquette Bldg., Archt. Noted Dec. 23.

Mo., St. Louis — Syndicate, c/o E. C. Thompson, Pierce Bldg., manufacturers of airplanes, is having preliminary plans prepared for the construction of a factory. Estimated cost $100,000. Private plans.

Neb., Lincoln—E. N. O'Shea and R. N. Rogers, 1345 M St., will build a 3 story, 50 x 142 ft., garage. Estimated cost $50,000. Miller & Craig, 126 South 11th St., Archts.

N. J., Newark—Auto Strop Safety Razor Co., 59 Lock St., will soon award contract for the construction of 1 story, 60 x 250 ft. addition to plant on Frelinghuysen Ave. Estimated cost $150,000. Parker & Shaffer, 280 Madison Ave., New York, N. Y., Archts. and Engrs.

O., Chillicothe—Dept. Highway & Public Works, G. F. Schlesinger, Dir., Ohio-Hartman Bldg., Columbus, is receiving bids for the construction of a 1 story, 80 x 300 ft. repair and service garage here. Estimated cost $65,000. H. B. Briggs, Ohio-Hartman Bldg., Archt. Noted Apr. 7.

O., Cleveland — The International Harvester Co., W. D. Price, Supt. of Construction, 606 South Michigan Ave., Chicago, Ill., will soon award contract for the construction of a 3 story, 120 x 145 ft. plant including warehouse at East 55th St. and Julia Ave. here. Estimated cost $250,000. Private plans.

O., Cleveland—The Wallace-Carnegie Co., c/o F. N. Riley, 862 Hanna Bldg., is receiving bids for the construction of a 3 story, 113 x 130 ft. garage at 8311 Carnegie Ave. Estimated cost $350,000. J. F. Steffens, Fidelity Bldg., Archt.

Pa., Philadelphia—General Electric Co., Witherspoon Bldg., will receive bids until June 21 for the construction of a 1 story, 141 x 554 ft. plant on Elmwood Ave. Harris & Richards, Drexel Bldg., Archts.

Pa., Upper Darby (Philadelphia P. O.)—W. Freihofer, 20th and Indiana Sts., Philadelphia, plans the construction of a 3 story garage at 69th and Ashbridge Sts. here. Hodgens & Hill, 130 South 15th St., Philadelphia, Archts.

Tex., Ft. Worth—Texas & Pacific Ry. Co., Dallas, awarded contract for the construction of a round house and car shop here. Estimated cost $600,000. E. F. Mitchell, Ch. Engr.

Tex., Rock Springs—E. Miller, is having plans prepared for the construction of a 2 story garage and repair shop. Estimated cost $50,000. Private plans.

Tex., San Antonio — Merchants Transfer Co., F. Canaday, Pres., 215 Main St., plans extensions and improvements to plant including garage and repair shops, etc., at Dolorosa Ave. and San Pedro Creek. Estimated cost $1,000,000. Private plans.

Va., Norfolk — The Barnum-Bruns Iron Works Inc., manufacturers of ornamental iron specialties, is having plans prepared for the construction of a 50 x 65 ft. plant.

W. Va., Bergoo—The Pardee & Curtain Lumber Co., Clarksburg, had plans prepared for the construction of a mill here. Estimated cost $350,000.

Wis., Sturgeon Bay—Severson & Konard, John and Garland Sts., will build a 2 story, 80 x 100 ft. shop and service station. Private plans. Noted May 12.

Ont., Toronto — The Massey-Harris Co., 915 King St. W., manufacturers of farm implements, plans the construction of a 4 story, 60 x 200 ft. addition to plant.

Ont., Windsor — Wabash Ry. Co., Exchange Bldg., St. Louis, Mo., and Canadian National Rys., Montreal, Que., plans the construction of new car shops here. Estimated cost $1,000,000. R. H. Howard, St. Louis, Mo., and C. S. Gzowski, Montreal, Que., Chn. Engrs.